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CONSTRUCTION GRANTS PROGRAM
INFORMATION
EPA-430/9-76-017b

VOLUME II
PB 266 782

appendixes 1-7

FEDERAL GUIDELINES

STATE AND LOCAL PRETREATMENT PROGRAMS

JANUARY 1977

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These guidelines were developed by the Environmental Protection Agency in accordance with Section 304(f) of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) for the purpose of assisting States and municipalities in carrying out programs under Section 402 including NPDES permit requirements.

The guidelines are a revision of the previous guidelines, "Pretreatment of Pollutants Introduced Into Publicly Owned Treatment Works." Contained in this revision is additional technical information on pollutants which may interfere with or pass through publicly owned treatment works. Also, guidance is presented to assist State and local governments in developing their own pretreatment programs to comply with NPDES permit conditions.

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VOLUME II

appendixes 1-7

FEDERAL GUIDELINES

STATE AND LOCAL PRETREATMENT PROGRAMS

JANUARY 1977

U.S.ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER PROGRAM OPERATIONS
MUNICIPAL CONSTRUCTION DIVISION
WASHINGTON, D.C. 20460

MCD-43

U.S. ENVIRONMENTAL PROTECTION AGENCY

FOREWORD

In response to the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), this country has undertaken an unprecedented program of cleaning up our Nation's waters. There will be a substantial investment by Federal, State, and local governments as well as by private industry in treatment works to achieve the goals of the Act. It is important that this investment in publicly owned treatment works (POTW's) be protected from damage and from interference with proper operation, and that receiving waters be protected from pollutants which may pass through the POTW.

These guidelines were developed by the Environmental Protection Agency in accordance with Section 304(f) of the Act for the purpose of assisting States and municipalities in carrying out programs under Section 402 including NPDES permit requirements. It is important to note the clear requirements in the Act that there be both national pretreatment standards, Federally enforceable, and pretreatment guidelines to assist States and municipalities in developing local pretreatment requirements. The Environmental Protection Agency encourages the establishment of local pretreatment requirements, tailored to local conditions.

The guidelines are a revision of the previous guidelines, "Pretreatment of Pollutants Introduced Into Publicly Owned Treatment Works." Contained in this revision is additional technical information on pollutants which may interfere with or pass through publicly owned treatment works. Also, guidance is presented to assist State and local governments in developing their own pretreatment programs to comply with NPDES permit conditions. The guidelines are the result of extensive reviews and numerous field trips and discussions with EPA Regional Offices, industry, city, regional, State and interstate agencies. We are extremely grateful for the cooperation of those who assisted in the preparation of the guidelines.

DEC 22 1976

/s/ John Quarles
The Administrator
Acting

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APPENDIX 1
PRETREATMENT STANDARDS

Pretreatment Standards

RESERVED

The general pretreatment standards were published in the Federal Register, November 8, 1973 (Vol. 38, p. 30982). They are currently under review for possible revision, and when changed will be proposed in the Federal Register.

APPENDIX 2
SECONDARY TREATMENT INFORMATION

federal register

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PART II

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ENVIRONMENTAL PROTECTION AGENCY

■

WATER PROGRAMS

Secondary Treatment Information

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER D—WATER PROGRAMS

PART 133—SECONDARY TREATMENT INFORMATION

On April 30, 1973, notice was published in the FEDERAL REGISTER that the Environmental Protection Agency was proposing information on secondary treatment pursuant to section 304(d)(1) of the Federal Water Pollution Control Act Amendments of 1972 (the Act). Reference should be made to the preamble of the proposed rulemaking for a description of the purposes and intended use of the regulation.

Written comments on the proposed rulemaking were invited and received from interested parties. The Environmental Protection Agency has carefully considered all comments received. All written comments are on file with the Agency.

The regulation has been reorganized and rewritten to improve clarity. Major changes that were made as a result of comments received are summarized below:

(a) The terms "1-week" and "1-month" as used in § 133.102 (a) and (b) of the proposed rulemaking have been changed to 7 consecutive days and 30 consecutive days respectively (See § 133.102 (a), (b), and (c)).

(b) Some comments indicated that the proposed rulemaking appeared to require 85 percent removal of biochemical oxygen demand and suspended solids only in cases when a treatment works would treat a substantial portion of extremely high strength industrial waste (See § 133.102(g) of the proposed rulemaking). The intent was that in no case should the percentage removal of biochemical oxygen demand and suspended solids in a 30 day period be less than 85 percent. This has been clarified in the regulation. In addition, it has been expressed as percent remaining rather than percent removal calculated using the arithmetic means of the values for influent and effluent samples collected in a 30 day period (See § 133.102(a) and (b)).

(c) Comments were made as to the difficulty of achieving 85 percent removal of biochemical oxygen demand and suspended solids during wet weather for treatment works receiving flows from combined sewer systems. Recognizing this, a paragraph was added which will allow waiver or adjustment of that requirement on a case-by-case basis (See § 133.103(a)).

(d) The definition of a 24-hour composite sample (See § 133.102(c) of the proposed rulemaking) was deleted from the regulation. The sampling requirements for publicly owned treatment works will be established in guidelines issued pursuant to sections 304(g) and 402 of the Act.

(e) In § 133.103 of the proposed rulemaking, it was recognized that secondary treatment processes are subject to upsets over which little or no control may be exercised. This provision has been deleted. It is no longer considered necessary in this regulation since procedures for notice and review of upset incidents will be included in discharge permits issued pursuant to section 402 of the Act.

(f) Paragraph (f) of § 133.102 of the proposed rulemaking, which relates to treatment works which receive substantial portions of high strength industrial wastes, has been rewritten for clarity. In addition, a provision has been added which limits the use of the upwards adjustment provision to only those cases in which the flow or loading from an industry category exceeds 10 percent of the design flow or loading of the treatment works. This intended to reduce or eliminate the administrative burden which would be involved in making insignificant adjustments in the biochemical oxygen demand and suspended solids criteria (See § 133.103(b)).

The major comments for which changes were not made are discussed below:

(a) Comments were received which recommended that the regulation be written to allow effluent limitations to be based on the treatment necessary to meet water quality standards. No change has been made in the regulations because the Act and its legislative history clearly show that the regulation is to be based on the capabilities of secondary treatment technology and not ambient water quality effects.

(b) A number of comments were received which pointed out that waste stabilization ponds alone are not generally capable of achieving the proposed effluent quality in terms of suspended solids and fecal coliform bacteria. A few commenters expressed the opposite view. The Agency is of the opinion that with proper design (including solids separation processes and disinfection in some cases) and operation, the level of effluent quality specified can be achieved with waste stabilization ponds. A technical bulletin will be published in the near future which will provide guidance on the design and operation of waste stabilization ponds.

(c) Disinfection must be employed in order to achieve the fecal coliform bacteria levels specified. A few commenters argued that disinfectant is not a secondary treatment process and therefore the fecal coliform bacteria requirements should be deleted. No changes were made because disinfection is considered by the Agency to be an important element of secondary treatment which is necessary for protection of public health (See § 133.102(c)).

Effective date. These regulations shall become effective on August 17, 1973.

JOHN QUARLES,
Acting Administrator

AUGUST 14, 1973.

Chapter I of title 40 of the Code of Federal Regulations is amended by adding a new Part 133 as follows:

Sec.
133.100 Purpose.
133.101 Authority.
133.102 Secondary treatment.
133.103 Special considerations.
133.104 Sampling and test procedures.

AUTHORITY: Secs. 304() (1), 301(b) (1) (B), Federal Water Pollution Control Act Amendments, 1972, P.L. 92–500.

§ 133.100 Purpose.

This part provides information on the level of effluent quality attainable through the application of secondary treatment.

§ 133.101 Authority.

The information contained in this Part is provided pursuant to sections 304(d) (1) and 301(b) (1) (B) of the Federal Water Pollution Control Act Amendments of 1972, PL 92–500 (the Act).

§ 133.102 Secondary treatment.

The following paragraphs describe the minimum level of effluent quality attainable by secondary treatment in terms of the parameters biochemical oxygen demand, suspended solids, fecal coliform bacteria and pH. All requirements for each parameter shall be achieved except as provided for in § 133.103.

(a) *Biochemical oxygen demand (five-day).* (1) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 30 milligrams per liter.

(2) The arithmetic mean of the values for effluent samples collected in a period of seven consecutive days shall not exceed 45 milligrams per liter.

(3) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85 percent removal).

(b) *Suspended solids.* (1) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 30 milligrams per liter.

(2) The arithmetic mean of the values for effluent samples collected in a period of seven consecutive days shall not exceed 45 milligrams per liter.

(3) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85 percent removal).

(c) *Fecal coliform bacteria.* (1) The geometric mean of the value for effluent samples collected in a period of 30 consecutive days shall not exceed 200 per 100 milliliters.

(2) The geometric mean of the values for effluent samples collected in a period of seven consecutive days shall not exceed 400 per 100 milliliters.

(d) *pH.* The effluent values for pH shall remain within the limits of 6.0 to 9.0.

§ 133.103 Special considerations.

(a) *Combined sewers.* Secondary treatment may not be capable of meeting the percentage removal requirements of paragraphs (a)(3) and (b)(3) of § 133.102 during wet weather in treatment works which receive flows from combined sewers (sewers which are designed to transport both storm water and sanitary sewage). For such treatment works, the decision must be made on a case-by-case basis as to whether any attainable percentage removal level can be defined, and if so, what that level should be.

(b) *Industrial wastes.* For certain industrial categories, the discharge to navigable waters of biochemical oxygen demand and suspended solids permitted under sections 301(b)(1)(A)(i) or 306 of the Act may be less stringent than the values given in paragraphs (a)(1) and (b)(1) of § 133.102. In cases when wastes would be introduced from such an industrial category into a publicly owned treatment works, the values for biochemical oxygen demand and suspended solids in paragraphs (a)(1) and (b)(1) of § 133.102 may be adjusted upwards provided that: (1) the permitted discharge of such pollutants, attributable to the industrial category, would not be greater than that which would be permitted under sections 301(b)(1)(a)(i) or 306 of the Act if such industrial category were to discharge directly into the navigable waters, and (2) the flow or loading of such pollutants introduced by the industrial category exceeds 10 percent of the design flow or loading of the publicly owned treatment works. When such an adjustment is made, the values for biochemical oxygen demand or suspended solids in paragraphs (a)(2) and (b)(2) of § 133.102 should be adjusted proportionally.

§ 133.104 Sampling and test procedures.

(a) Sampling and test procedures for pollutants listed in § 133.102 shall be in accordance with guidelines promulgated by the Administrator pursuant to sections 304(g) and 402 of the Act.

(b) Chemical oxygen demand (COD) or total organic carbon (TOC) may be substituted for biochemical oxygen demand (BOD) when a long-term BOD: COD or BOD:TOC correlation has been demonstrated.

[FR Doc.73-17194 Filed 8-16-73;8:45 am]

APPENDIX 3
TEST PROCEDURES FOR ANALYSIS OF POLLUTANTS

Guidelines Establishing Test Procedures
for Analysis of Pollutants (December 1, 1976)

federal register

WEDNESDAY, DECEMBER 1, 1976

THE NATIONAL ARCHIVES OF THE UNITED STATES 1934

PART II:

ENVIRONMENTAL PROTECTION AGENCY

■

WATER PROGRAMS

Guidelines Establishing Test Procedures for the Analysis of Pollutants

Amendments

3-1-A

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER D—WATER PROGRAMS

[FRL 680-4]

PART 136—GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS

Amendment of Regulations

On June 9, 1975, proposed amendments to the Guidelines Establishing Test Procedures for the Analysis of Pollutants (40 CFR 136) were published in the FEDERAL REGISTER (40 FR 24535) as required by section 304(g) of the Federal Water Pollution Control Act Amendments of 1972 (86 Stat. 816, et seq., Pub. L. 92-500, 1972) hereinafter referred to as the Act.

Section 304(g) of the Act requires that the Administrator shall promulgate guidelines establishing test procedures for the analysis of pollutants that shall include factors which must be provided in: (1) any certification pursuant to section 401 of the Act, or (2) any permit application pursuant to section 402 of the Act. Such test procedures are to be used by permit applicants to demonstrate that effluent discharges meet applicable pollutant discharge limitations and by the States and other enforcement activities in routine or random monitoring of effluents to verify compliance with pollution control measures.

Interested persons were requested to submit written comments, suggestions, or objections to the proposed amendments by September 7, 1975. One hundred and thirty-five letters were received from commenters. The following categories of organizations were represented by the commenters: Federal agencies accounted for twenty-four responses; State agencies accounted for twenty-six responses; local agencies accounted for seventeen responses; regulated major dischargers accounted for forty-seven responses; trade and professional organizations accounted for eight responses; analytical instrument manufacturers and vendors accounted for seven responses; and analytical service laboratories accounted for six responses.

All comments were carefully evaluated by a technical review committee. Based upon the review of comments, the following principal changes to the proposed amendments were made:

(A) *Definitions.* Section 136.2 has been amended to update references: Twenty commenters, representing the entire spectrum of responding groups pointed out that the references cited in §§ 136.2 (f), 136.2(g), and 136.2(h) were out-of-date; §§ 136.2(f), 136.2(g), and 136.2(h), respectively, have been amended to show the following editions of the standard references: "14th Edition of Standard Methods for the Examination of Water and Waste Water;" "1974 EPA Manual of Methods for the Analysis of Water and Waste;" and "Part 31, 1975 Annual Book of ASTM Standards."

(B) *Identification of Test Procedures.* Both the content and format of § 136.3, "Table I, List of Approved Test Procedures" have been revised in response to twenty-one comments received from State and local governments, major regulated dischargers, professional and trade associations, and analytical laboratories.

Table I has been revised by:

(1) The addition of a fourth column of references which includes procedures of the United States Geological Survey which are equivalent to previously approved methods.

(2) The addition of a fifth column of miscellaneous references to procedures which are equivalent to previously approved methods.

(3) Listing generically related parameters alphabetically within four subcategories: bacteria, metals, radiological and residue, and by listing these subcategory headings in alphabetic sequence relative to the remaining parameters.

(4) Deleting the parameter "Algicides" and by entering the single relevant algicide, "Pentachlorophenol" by its chemical name.

(C) *Clarification of Test Parameters.* The conditions for analysis of several parameters have been more specifically defined as a result of comments received by the Agency:

(1) In response to five commenters representing State or local governments, major dischargers, or analytical instrument manufacturers, the end-point for the alkalinity determination is specifically designated as pH 4.5.

(2) Manual digestion and distillation are still required as necessary preliminary steps for the Kjeldahl nitrogen procedure. Analysis after such distillation may be by Nessler color comparison, titration, electrode, or automated phenolate procedures.

(3) In response to eight commenters representative of Federal and State governments, major dischargers, and analytical instrument manufacturers, manual distillation at pH 9.5 is now specified for ammonia measurement.

(D) *New Parameters and Analytical Procedures.* Forty-four new parameters have been added to Table I. In addition to the designation of analytical procedures for these new parameters, the following modifications have been made in analytical procedures designated in response to comments.

(1) The ortho-tolidine procedure was not approved for the measurement of residual chlorine because of its poor accuracy and precision. Its approval had been requested by seven commenters representing major dischargers, State, or local governments, and analytical instrument manufacturers. Instead, the N,N-diethyl-p-phenylenediamine (DPD) method is approved as an interim procedure pending more intensive laboratory testing. It has many of the advantages of the ortho-tolidine procedure such as low cost, ease of operation, and also is of acceptable precision and accuracy.

(2) The Environmental Protection Agency concurred with the American Dye Manufacturers' request to approve its procedure for measurement of color, and copies of the procedure are now available at the Environmental Monitoring and Support Laboratory, Cincinnati (EMSL-CI).

(3) In response to three requests from Federal, State governments, and dischargers, "hardness," may be measured as the sum of calcium and magnesium analyzed by atomic absorption and expressed as their carbonates.

(4) The proposal to limit measurement of fecal coliform bacteria in the presence of chlorine to only the "Most Probable Number" (MPN) procedure has been withdrawn in response to requests from forty-five commenters including State pollution control agencies, permit holders, analysts, treatment plant operators, and a manufacturer of analytical supplies. The membrane filter (MF) procedure will continue to be an approved technique for the routine measurement of fecal coliform in the presence of chlorine. However, the MPN procedure must be used to resolve controversial situations. The technique selected by the analyst must be reported with the data.

(5) A total of fifteen objections, representing the entire spectrum of commenters, addressed the drying temperatures used for measurement of residues. The use of different temperatures in drying of total residue, dissolved residue and suspended residue was cited as not allowing direct intercomparability between these measurements. Because the intent of designating the three separate residue parameters is to measure separate waste characteristics (low drying temperatures to measure volatile substances, high drying temperatures to measure anhydrous inorganic substances), the difference in drying temperatures for these residue parameters must be preserved.

(E) *Deletion of Measurement Techniques.* Some measurement techniques that had been proposed have been deleted in response to objections raised during the public comment period.

(1) The proposed infrared spectrophotometric analysis for oil and grease has been withdrawn. Eleven commenters representing Federal or State agencies and major dischargers claimed that this parameter is defined by the measurement procedure. Any alteration in the procedure would change the definition of the parameter. The Environmental Protection Agency agreed.

(2) The proposed separate parameter for sulfide at concentrations below 1 mg/l, has been withdrawn. Methylene blue spectrophotometry is now included in Table I as an approved procedure for sulfide analysis. The titrimetric iodine procedure for sulfide analysis may only be used for analysis of sulfide at concentrations in excess of one milligram per liter.

(F) *Sample Preservation and Holding Times.* Criteria for sample preservation and sample holding times were requested by several commenters. The reference for sample preservation and holding time criteria applicable to the Table I parameters is given in footnote (1) of Table I.

(G) *Alternate Test Procedures.* Comments pertaining to § 136.4, Application for Alternate Test Procedures, included objections to various obstacles within these procedures for expeditious approval of alternate test procedures. Four analytical instrument manufacturers commented that by limiting of application for review and/or approval of alternate test procedures to NPDES permit holders, § 136.4 became an impediment to the commercial development of new or improved measurement devices based on new measurement principles. Applications for such review and/or approval will now be accepted from any person. The intent of the alternate test procedure is to allow the use of measurement systems which are known to be equivalent to the approved test procedures in waste water discharges.

Applications for approval of alternate test procedures applicable to specific discharges will continue to be made only by NPDES permit holders, and approval of such applications will be made on a case-by-case basis by the Regional Administrator in whose Region the discharge is made.

Applications for approval of alternate test procedures which are intended for nationwide use can now be submitted by any person directly to the Director of the Environmental Monitoring and Support Laboratory in Cincinnati. Such applications should include a complete methods write-up, any literature references, comparability data between the proposed alternate test procedure and those already approved by the Administrator. The application should include precision and accuracy data of the proposed alternate test procedure and data confirming the general applicability of the test procedure to the industrial categories of waste water for which it is intended. The Director of the Environmental Monitoring and Support Laboratory, after review of submitted information, will recommend approval or rejection of the application to the Administrator, or he will return the application to the applicant for more information. Approval or rejection of applications for test procedures intended for nationwide use will be made by the Administrator, after considering the recommendation made by the Director of the Environmental Monitoring and Support Laboratory, Cincinnati. Since the Agency considers these procedures for approval of alternate test procedures for nationwide use to be interim procedures, we will welcome suggestions for criteria for approval of alternate test procedures for nationwide use. Interested persons should submit their written comments in triplicate on or before June 1, 1977 to: Dr. Robert B. Medz, Environmental Protection Technologist, Monitoring Quality Assurance Standardization, Office of Monitoring and Technical Support (RD-680), Environmental Protection Agency, Washington, D.C. 20460.

(H) *Freedom of Information*. A copy of all public comments, an analysis by parameter of those comments, and documents providing further information on the rationale for the changes made in the final regulation are available for inspection and copying at the Environmental Protection Agency Public Information Reference Unit, Room 2922, Waterside Mall, 401 M Street, SW., Washington, D.C. 20460, during normal business hours. The EPA information regulation 40 CFR 2 provides that a reasonable fee may be charged for copying such documents.

Effective date: These amendments become effective on April 1, 1977.

Dated: November 19, 1976.

JOHN QUARLES,
Acting Administrator,
Environmental Protection Agency.

Chapter I, Subchapter D, of Title 40, Code of Federal Regulations is amended as follows:

1. In § 136.2, paragraphs (f), (g), and (h) are amended to read as follows:

§ 136.2 Definitions.

* * * * *

(f) "Standard Methods" means *Standard Methods for the Examination of Water and Waste Water*, 14th Edition, 1976. This publication is available from the American Public Health Association, 1015 18th Street, N.W., Washington, D.C. 20036.

(g) "ASTM" means *Annual Book of Standards, Part 31, Water, 1975*. This publication is available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

(h) "EPA Methods" means *Methods for Chemical Analysis of Water and Waste, 1974*. Methods Development and Quality Assurance Research Laboratory, National Environmental Research Center, Cincinnati, Ohio 45268; U.S. Environmental Protection Agency, Office of Technology Transfer, Industrial Environmental Research Laboratory, Cincinnati, Ohio 45268. This publication is available from the Office of Technology Transfer.

2. In § 136.3, the second sentence of paragraph (b) is amended, and a new paragraph (c) is added to read as follows:

§ 136.3 Identification of test procedures.

* * * * *

(b) * * * Under such circumstances, additional test procedures for analysis of pollutants may be specified by the Regional Administrator or the Director upon the recommendation of the Director of the Environmental Monitoring and Support Laboratory, Cincinnati.

(c) Under certain circumstances, the Administrator may approve, upon recommendation by the Director, Environmental Monitoring and Support Laboratory, Cincinnati, additional alternate test procedures for nationwide use.

3. Table I of § 136.3 is revised by listing the parameters alphabetically; by adding 44 new parameters; by adding a fourth column under references listing equivalent United States Geological Survey methods; by adding a fifth column under references listing miscellaneous equivalent methods; by deleting footnotes 1 through 7 and adding 24 new footnotes, to read as follows:

* * * * *

TABLE I.—*List of approved test procedures*[1]

Parameter and units	Method	1974 EPA methods	14th ed. standard methods	References (page nos.) Pt. 31 1975 ASTM	USGS methods[3]	Other approved methods
1. Acidity, as $CaCO_3$, milligrams per liter.	Electrometric end point (pH of 8.2) or phenolphthalein end point.	1	273(4d)	116	[3]40	[8](607)
2. Alkalinity, as $CaCO_3$, milligrams per liter.	Electrometric titration (only to pH 4.5) manual or automated, or equivalent automated methods.	3 5	278	111	41	[8](607)
3. Ammonia (as N), milligrams per liter.	Manual distillation[4] (at pH 9.5) followed by nesslerization, titration, electrode. Automated phenolate.	159 165 168	410 412 616	237	116	[8](614)
BACTERIA						
4. Coliform (fecal)[5], number per 100 ml.	MPN;[6] membrane filter.		922 937		[7](45)	
5. Coliform (fecal)[5] in presence of chlorine, number per 100 ml.	do.[6][8]		922 928, 937			
6. Coliform (total),[5] number per 100 ml.	do.[6]		916 928		[7](35)	
7. Coliform (total)[5] in presence of chlorine, number per 100 ml.	MPN;[6] membrane filter with enrichment.		916 933			
8. Fecal streptococci,[5] number per 100 ml.	MPN;[6] membrane filter; plate count.		942 944 947		[7](50)	
9. Benzidine, milligrams per liter.	Oxidation—colorimetric[9]					
10. Biochemical oxygen demand, 5-d (BOD_5), milligrams per liter.	Winkler (Azide modification) or electrode method.		543		[7](50)	
11. Bromide, milligrams per liter.	Titrimetric, iodine-iodate.	14		323	58	[10](17)
12. Chemical oxygen demand (COD), milligrams per liter.	Dichromate reflux.	20	550	472	124	[8](610)
13. Chloride, milligrams per liter.	Silver nitrate; mercuric nitrate; or automated colorimetric-ferricyanide.	29 31	303 304 613	267 265	[11](46)	[10](17) [8](615)

See footnotes at end of table.

Parameter and units	Method	1974 EPA methods	14th ed. standard methods	Pt. 31 1975 ASTM	USGS methods[8]	Other approved methods
		References (page nos.)				
14. Chlorinated organic compounds (except pesticides), milligrams per liter.	Gas chromatography[12]					
15. Chlorine—total residual, milligrams per liter	Iodometric titration, amperometric or starch-iodine end-point; DPD colorimetric or Titrimetric methods (these last 2 are interim methods pending laboratory testing).	 35	318 322 332 329	 278		
16. Color, platinum cobalt units or dominant wave length, hue, luminance, purity.	Colorimetric; spectrophotometric; or ADMI procedure.[13]	36 39	64 66		82	
17. Cyanide, total,[14] milligrams per liter.	Distillation followed by silver nitrate titration or pyridine pyrazolone (or barbituric acid) colorimetric.	40	361	503	85	[10](22)
18. Cyanide amenable to chlorination, milligrams per liter.	do	49	376	505		
19. Dissolved oxygen, milligrams per liter.	Winkler (Azide modification) or electrode method.	51 56	443 450	360	126	[3](609)
20. Fluoride, milligrams per liter.	Distillation[6] followed by ion electrode; SPADNS; or automated complexone.	 65 59 61	389 391 393 614	 307 305	 93	
21. Hardness—Total, as $CaCO_3$, milligrams per liter.	EDTA titration; automated colorimetric; or atomic absorption (sum of Ca and Mg as their respective carbonates).	68 70	202	161	94	[3](617)
22. Hydrogen ion (pH), pH units.	Electrometric measurement.	239	460	178	129	[3](600)
23. Kjeldahl nitrogen (as N), milligrams per liter.	Digestion and distillation followed by nesslerization, titration, or electrode; automated digestion automated phenolate.	175 165 182	437		122	[3](612)
METALS						
24. Aluminum—Total, milligrams per liter.	Digestion[15] followed by atomic absorption[16] or by colorimetric (Eriochrome Cyanine R).	92	152 171		[11] (19)	
25. Aluminum—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced methods for total aluminum.					
26. Antimony—Total, milligrams per liter.	Digestion[15] followed by atomic absorption.[16]	94				
27. Antimony—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total antimony.					
28. Arsenic—Total, milligrams per liter.	Digestion followed by silver diethyldithiocarbamate; or atomic absorption.[16] [18]	 9 95	285 283 159		 [11] (32) [11] (37)	
29. Arsenic—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total arsenic.					
30. Barium—Total, milligrams per liter.	Digestion[15] followed by atomic absorption.[16]	97	152		52	
31. Barium—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total barium.					
32. Beryllium—Total, milligrams per liter.	Digestion[15] followed by atomic absorption[16] or by colorimetric (Aluminon).	99	152 177		53	
33. Beryllium—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total beryllium.					
34. Boron—Total, milligrams per liter.	Colorimetric (Curcumin)	13	287			
35. Boron—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total boron.					
36. Cadmium—Total, milligrams per liter.	Digestion[15] followed by atomic absorption[16] or by colorimetric (Dithizone).	101	148 182	345	62	[3] (619) [19] (37)
37. Cadmium—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total cadmium.					
38. Calcium—Total, milligrams per liter.	Digestion[15] followed by atomic absorption; or EDTA titration.	103	148 189	345	66	
39. Calcium—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total calcium.					
40. Chromium VI, milligrams per liter.	Extraction and atomic absorption; colorimetric (Diphenylcarbazide).	89, 105	 192		76 75	
41. Chromium VI—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for chromium VI.					
42. Chromium—Total, milligrams per liter.	Digestion[15] followed by atomic absorption[16] or by colorimetric (Diphenylcarbazide).	105	148 192	345 286	78 77	[3] (619)
43. Chromium—Dissolved, milligrams per liter.	0.45 micron filtration[17] followed by referenced method for total chromium.					

See footnotes at end of table.

Parameter and units	Method	1974 EPA methods	14th ed. standard methods	References (page nos.)		Other approved methods
				Pt. 31 1975 ASTM	USGS methods [9]	
44. Cobalt—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[16]	107	148	345	80	[19] (37)
45. Cobalt—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total cobalt.					
46. Copper—Total, milligrams per liter.	Digestion [14] followed by atomic absorption [16] or by colorimetric (Neocuproine).	108	148 196	345 298	83	[8] (619) [19] (37)
47. Copper—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total copper.					
48. Gold—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]					
49. Iridium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]					
50. Iron—Total, milligrams per liter.	Digestion [14] followed by atomic absorption [16] or by colorimetric (Phenanthroline).	110	148 208	345 326	102	[8] (619)
51. Iron—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total iron.					
52. Lead—Total, milligrams per liter.	Digestion [14] followed by atomic absorption [16] or by colorimetric (Dithizone).	112	148 215	345	106	[8] (619)
53. Lead—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total lead.					
54. Magnesium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption; or gravimetric.	114	148 221	345	109	[8] (619)
55. Magnesium—Dissolved milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total magnesium.					
56. Manganese—Total milligrams per liter.	Digestion [14] followed by atomic absorption [16] or by colorimetric (Persulfate or periodate).	116	148 225, 227	345	111	[8] (619)
57. Manganese—Dissolved milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total manganese.					
58. Mercury—Total, milligrams per liter.	Flameless atomic absorption.	118	156	538	[11] (51)	
59. Mercury—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total mercury.					
60. Molybdenum—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]	139		350		
61. Molybdenum—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total molybdenum.					
62. Nickel—Total, milligrams per liter.	Digestion [14] followed by atomic absorption [16] or by colorimetric (Heptoxime).	141	148	345	115	
63. Nickel—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total nickel.					
64. Osmium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]					
65. Palladium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]					
66. Platinum—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]					
67. Potassium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption, colorimetric (Cobaltinitrite), or by flame photometric.	143	 285 283	 403	134	[8] (620)
68. Potassium—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total potassium.					
69. Rhodium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]					
70. Ruthenium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[18]					
71. Selenium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption.[16] [18]	145	159			
72. Selenium—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total selenium.					
73. Silica—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by colorimetric (Molybdosilicate).	274	487	398	139	
74. Silver—Total,[20] milligrams per liter.	Digestion [14] followed by atomic absorption [16] or by colorimetric (Dithizone).	146	148 243		142	[8](619) [19](37)
75. Silver—Dissolved,[20] milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total silver.					
76. Sodium—Total, milligrams per liter.	Digestion [14] followed by atomic absorption or by flame photometric.	147	 250	 403	143	[8] (621)
77. Sodium—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total sodium.					

See footnotes at end of table.

Parameter and units	Method	1974 EPA methods	14th ed. standard methods	References (page nos.) Pt. 31 1975 ASTM	References (page nos.) USGS methods [1]	Other approved methods
78. Thallium—Total, milligrams per liter.	Digestion [16] followed by atomic absorption.[18]	149				
79. Thallium—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total thallium.					
80. Tin—Total, milligrams per liter.	Digestion [16] followed by atomic absorption.[18]	150			[11] (65)	
81. Tin—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total tin.					
82. Titanium—Total, milligrams per liter.	Digestion [16] followed by atomic absorption.[18]	151				
83. Titanium—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total titanium.					
84. Vanadium—Total, milligrams per liter.	Digestion [16] followed by atomic absorption [16] or by colorimetric (Gallic acid).	153	152 260	 441	 [11] (67)	
85. Vanadium—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total vanadium.					
86. Zinc—Total, milligrams per liter.	Digestion [16] followed by atomic absorption [16] or by colorimetric (Dithizone).	155	148 265	345	150	[3](619) [10](37)
87. Zinc—Dissolved, milligrams per liter.	0.45 micron filtration [17] followed by referenced method for total zinc.					
88. Nitrate (as N), milligrams per liter.	Cadmium reduction; brucine sulfate; automated cadmium or hydrazine reduction.[22]	201 197 207	423 427 620	 358	 119	 [3](614) [10](28)
89. Nitrite (as N), milligrams per liter.	Manual or automated colorimetric (Diazotization).	215	434		121	
90. Oil and grease, milligrams per liter.	Liquid-liquid extraction with trichloro-trifluoroethane-gravimetric.	229	515			
91. Organic carbon; total (TOC), milligrams per liter.	Combustion—Infrared method.[23]	236	532	467	[27] (4)	
92. Organic nitrogen (as N), milligrams per liter.	Kjeldahl nitrogen minus ammonia nitrogen.	175, 159	437		122	[3] (612, 614)
93. Orthophosphate (as P), milligrams per liter.	Manual or automated ascorbic acid reduction.	249 256	481 624	384	131	[3] (621)
94. Pentachlorophenol, milligrams per liter.	Gas chromatography [19]					
95. Pesticides, milligrams per liter.	do.[19]		555	529	[20] (24)	
96. Phenols, milligrams per liter.	Colorimetric, (4AAP)	241	582	545		
97. Phosphorus (elemental), milligrams per liter.	Gas chromatography [24]					
98. Phosphorus; total (as P), milligrams per liter.	Persulfate digestion followed by manual or automated ascorbic acid reduction.	249 256	476, 481 624	384	133	[3] (621)
RADIOLOGICAL						
99. Alpha—Total, pCi per liter	Proportional or scintillation counter.		648	501	[11] (75+78)	
100. Alpha—Counting error, pCi per liter.	do.		648	504	[11] (79)	
101. Beta—Total, pCi per liter	Proportional counter		648	501	[11] (75+78)	
102. Beta—Counting error, pCi per liter.	do.		648	508	[11] (79)	
103. (a) Radium—Total, pCi per liter.	do.		661	661		
(b) ^{226}Ra, pCi per liter	Scintillation counter		667		[11] (81)	
RESIDUE						
104. Total, milligrams per liter	Gravimetric, 103 to 105° C	270	91			
105. Total dissolved (filterable), milligrams per liter.	Glass fiber filtration, 180° C.	266	92			
106. Total-suspended (nonfilterable), milligrams per liter.	Glass fiber filtration, 103 to 105° C.	268	94			
107. Settleable, milliliters per liter or milligrams per liter.	Volumetric or gravimetric		95			
108. Total volatile, milligrams per liter.	Gravimetric, 550° C	272	95			
109. Specific conductance, micromhos per centimeter at 25° C.	Wheatstone bridge conductimetry.	275	71	120	148	[3] (606)
110. Sulfate (as SO_4), milligrams per liter.	Gravimetric; turbidimetric; or automated colorimetric (barium chloranilate).	 277 279	493 496	424 425		[3] (624) [3] (623)
111. Sulfide (as S), milligrams per liter.	Titrimetric—Iodine for levels greater than 1 mg per liter; Methylene blue photometric.	284	505 503		154	
112. Sulfite (as SO_3), milligrams per liter.	Titrimetric, iodine-iodate	285	508	435		
113. Surfactants, milligrams per liter.	Colorimetric (Methylene blue).	157	600	494	[20] (11)	
114. Temperature, degrees C	Calibrated glass or electrometric thermometer.	286	125		[20] (31)	
115. Turbidity, NTU	Nephelometric	295	132	223	156	

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[1] Recommendations for sampling and preservation of samples according to parameter measured may be found in "Methods for Chemical Analysis of Water and Wastes, 1974" U.S. Environmental Protection Agency, table 2, pp. viii–xii.

[2] All page references for USGS methods, unless otherwise noted, are to Brown, E., Skougstad, M. W., and Fishman, M. J., "Methods for Collection and Analysis of Water Samples for Dissolved Minerals and Gases," U.S. Geological Survey Techniques of Water-Resources Inv., book 5, ch. A1, (1970).

[3] EPA comparable method may be found on indicated page of "Official Methods of Analysis of the Association of Official Analytical Chemists" methods manual, 12th ed. (1975).

[4] Manual distillation is not required if comparability data on representative effluent samples are on company file to show that this preliminary distillation step is not necessary; however, manual distillation will be required to resolve any controversies.

[5] The method used must be specified.

[6] The 5 tube MPN is used.

[7] Slack, K. V. and others, "Methods for Collection and Analysis of Aquatic Biological and Microbiological Samples: U.S. Geological Survey Techniques of Water-Resources Inv. book 5, ch. A4 (1973)."

[8] Since the membrane filter technique usually yields low and variable recovery from chlorinated wastewaters, the MPN method will be required to resolve any controversies.

[9] Adequately tested methods for benzidine are not available. Until approved methods are available, the following interim method can be used for the estimation of benzidine: (1) "Method for Benzidine and Its Salts in Wastewaters," available from Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

[10] American National Standard on Photographic Processing Effluents, Apr. 2, 1975. Available from ANSI, 1430 Broadway, New York, N.Y. 10018.

[11] Fishman, M. J. and Brown, Eugene, "Selected Methods of the U.S. Geological Survey for Analysis of Wastewaters," (1976) open-file report 76-177.

[12] Procedures for pentachlorophenol, chlorinated organic compounds, and pesticides can be obtained from the Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

[13] Color method (ADMI procedure) available from Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

[14] For samples suspected of having thiocyanate interference, magnesium chloride is used as the digestion catalyst. In the approved test procedure for cyanides, the recommended catalysts are replaced with 20 ml of a solution of 510 g/l magnesium chloride ($MgCl_2 \cdot 6H_2O$). This substitution will eliminate thiocyanate interference for both total cyanide and cyanide amendable to chlorination measurements.

[15] For the determination of total metals the sample is not filtered before processing. Because vigorous digestion procedures may result in a loss of certain metals through precipitation, a less vigorous treatment is recommended as given on p. 83 (4.1.4) of "Methods for Chemical Analysis of Water and Wastes" (1974). In those instances where a more vigorous digestion is desired the procedure on p. 83 (4.1.3) should be followed. For the measurement of the noble metal series (gold, iridium, osmium, palladium, platinum, rhodium and ruthenium), an aqua regia digestion is to be substituted as follows: Transfer a representative aliquot of the well-mixed sample to a Griffin beaker and add 3 ml of concentrated redistilled HNO_3. Place the beaker on a steam bath and evaporate to dryness. Cool the beaker and cautiously add a 5 ml portion of aqua regia. (Aqua regia is prepared immediately before use by carefully adding 3 volumes of concentrated HCl to one volume of concentrated HNO_3.) Cover the beaker with a watch glass and return to the steam bath. Continue heating the covered beaker for 50 min. Remove cover and evaporate to dryness. Cool and take up the residue in a small quantity of 1:1 HCl. Wash down the beaker walls and watch glass with distilled water and filter the sample to remove silicates and other insoluble material that could clog the atomizer. Adjust the volume to some predetermined value based on the expected metal concentration. The sample is now ready for analysis.

[16] As the various furnace devices (flameless AA) are essentially atomic absorption techniques, they are considered to be approved test methods. Methods of standard addition are to be followed as noted in p. 78 of "Methods for Chemical Analysis of Water and Wastes," 1974.

[17] Dissolved metals are defined as those constituents which will pass though a 0.45 μm membrane filter. A prefiltration is permissible to free the sample from larger suspended solids. Filter the sample as soon as practical after collection using the first 50 to 100 ml to rinse the filter flask. (Glass or plastic filtering apparatus are recommended to avoid possible contamination.) Discard the portion used to rinse the flask and collect the required volume of filtrate. Acidify the filtrate with 1:1 redistilled HNO_3 to a pH of 2. Normally, 3 ml of (1:1) acid per liter should be sufficient to preserve the samples.

[18] See "Atomic Absorption Newsletter," vol. 13, 75 (1974). Available from Perkin-Elmer Corp., Main Ave., Norwalk, Conn. 06852.

[19] Method available from Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

[20] Recommended methods for the analysis of silver in industrial wastewaters at concentrations of 1 mg/l and above are inadequate where silver exists as an inorganic halide. Silver halides such as the bromide and chloride are relatively insoluble in reagents such as nitric acid but are readily soluble in an aqueous buffer of sodium thiosulfate and sodium hydroxide to a pH of 12. Therefore, for levels of silver above 1 mg/l 20 ml of sample should be diluted to 100 ml by adding 40 ml each of 2M $Na_2S_2O_3$ and 2M NaOH. Standards should be prepared in the same manner. For levels of silver below 1 mg/l the recommended method is satisfactory.

[21] An automated hydrazine reduction method is available from the Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

[22] A number of such systems manufactured by various companies are considered to be comparable in their performance. In addition, another technique, based on combustion-methane detection is also acceptable.

[23] Goerlitz, D., Brown, E., "Methods for Analysis of Organic Substances in Water": U.S. Geological Survey Techniques of Water-Resources Inv., book 5, ch. A3 (1972).

[24] R. F. Addison and R. G. Ackman, "Direct Determination of Elemental Phosphorus by Gas-Liquid Chromatography," "Journal of Chromatography," vol. 47, No. 3, pp. 421-426, 1970.

[25] The method found on p. 75 measures only the dissolved portion while the method on p. 78 measures only suspended. Therefore, the 2 results must be added together to obtain "total."

[26] Stevens, H. H., Ficke, J. F., and Smoot, G. F., "Water Temperature—Influential Factors, Field Measurement and Data Presentation: U.S. Geological Survey Techniques of Water Resources Inv., book 1 (1975)."

4. In § 136.4, the second sentence of paragraph (c) is amended by deleting the word "subchapter" immediately following the phrase "procedure under this" and immediately preceding the word "shall" and replaced with the phrase "paragraph c;" and § 136.4 is amended by adding a new paragraph (d) to read as follows:

§ 136.4 Application for alternate test procedures.

* * * * *

(c) * * * Any application for an alternate test procedure under this paragraph (c) shall: * * *

(d) An application for approval of an alternate test procedure for nationwide use may be made by letter in triplicate to the Director, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268. Any application for an alternate test procedure under this paragraph (d) shall:

(1) Provide the name and address of the responsible person or firm making the application.

(2) Identify the pollutant(s) or parameter(s) for which nationwide approval of an alternate testing procedure is being requested.

(3) Provide a detailed description of the proposed alternate procedure, together with references to published or other studies confirming the general applicability of the alternate test procedure to the pollutant(s) or parameter(s) in waste water discharges from representative and specified industrial or other categories.

(4) Provide comparability data for the performance of the proposed alternate test procedure compared to the performance of the approved test procedures.

§ 136.5 [Amended]

5. In § 136.5, paragraph (a) is amended by inserting the phrase "proposed by the responsible person or firm making the discharge" immediately after the words "test procedure" and before the period that ends the paragraph.

6. In § 136.5, paragraph (b) is amended by inserting in the first sentence the phrase "proposed by the responsible person or firm making the discharge" immediately after the words "such application" and immediately before the comma. The second sentence of paragraph (b) is amended by deleting the phrase "Methods Development and Quality Assurance Research Laboratory" immediately after the phrase "State Permit Program and to the Director of the" at the end of the sentence, and inserting in its place the phrase "Environmental Monitoring and Support Laboratory, Cincinnati."

7. In § 136.5, paragraph (c) is amended by inserting the phrase "proposed by the responsible person or firm making the discharge" immediately after the phrase "application for an alternate test procedure" and immediately before the comma; and by deleting the phrase "Methods Development and Quality Assurance Laboratory" immediately after the phrase "application to the Director of the" and immediately before the phrase "for review and recommendation" and inserting in its place the phrase "Environmental Monitoring and Support Laboratory, Cincinnati."

8. In § 136.5, the first sentence of paragraph (d) is amended by inserting the phrase, "proposed by the responsible person or firm making the discharge," immediately after the phrase, "application for an alternate test procedure," and immediately before the comma.

The second sentence of paragraph (d) is amended by deleting the phrase, "Methods Development and Quality Assurance Research Laboratory," immediately after the phrase, "to the Regional Administrator by the Director of the," and immediately preceding the period ending the sentence and inserting in its place the phrase, "Environmental Monitoring and Support Laboratory, Cincinnati."

The third sentence of paragraph (d) is amended by deleting the phrase "Methods Development and Quality Assurance Research Laboratory," immediately after the phrase, "forwarded to the Director," and immediately before the second comma and by inserting in its place the phrase, "Environmental Monitoring and Support Laboratory, Cincinnati."

9. Section 136.5 is amended by the addition of a new paragraph (e) to read as follows:

§ 136.5 Approval of alternate test procedures.

* * * * *

(e) Within ninety days of the receipt by the Director of the Environmental Monitoring and Support Laboratory, Cincinnati of an application for an alternate test procedure for nationwide use, the Director of the Environmental Monitoring and Support Laboratory, Cincinnati shall notify the applicant of his recommendation to the Administrator to approve or reject the application, or shall specify additional information which is required to determine whether to approve the proposed test procedure. After such notification, an alternate method determined by the Administrator to satisfy the applicable requirements of this part shall be approved for nationwide use to satisfy the requirements of this subchapter; alternate test procedures determined by the Administrator not to meet the applicable requirements of this part shall be rejected. Notice of these determinations shall be submitted for publication in the FEDERAL REGISTER not later than 15 days after such notification and determination is made.

[FR Doc.76-35082 Filed 11-30-76;8:45 am]

APPENDIX 4
EFFLUENT GUIDELINES AND STANDARDS

Pretreatment Standards for Oil and Grease; Request for Public Comments

final location maps of all survey stations; and

(2) All common depth point and high resolution seismic data developed under an exploration permit including the processed information derived therefrom with extraneous signals and interference removed, in a format and quality suitable for interpretative evaluation, reflecting state-of-the-art processing techniques; and other data including, but not limited to, shallow and deep subbottom profiles, bathymetry, side-scan sonar, magnetometer, and bottom profiles; gravity and magnetic; and data from special studies such as from refraction surveys, velocity surveys and domal configuration studies.

§ 251.15 Public availability of records.

Geological and geophysical data, including processed information relating to submerged lands on the Outer Continental Shelf collected pursuant to a permit issued after the publication of these regulations and required to be submitted to the Supervisor under this part, shall be made available for public inspection by the Supervisor as follows:

(a) Geophysical data including processed information—ten years after issuance of a permit to conduct exploration.

(b) Geological data and processed information:

(1) Immediate release through public notice of the discovery during drilling operations of oil shows and environmental hazards on unleased lands when these shows or hazards are judged to be significant by the Director.

(2) Ten years after issuance of the permit to conduct exploration except for deep stratigraphic drilling.

(3) Five years after the date of completion of a test well or 60 calendar days after the issuance of the first Federal lease within 50 geographic miles of the drill site, whichever is earliest, for deep stratigraphic drilling.

CANCELLATION, PENALTIES AND APPEALS

§ 251.20 Revocation and cancellation.

The Supervisor is authorized to suspend or revoke a permit under which the operation is being conducted, or is proposed to be conducted, which in his judgment threatens immediate, serious, or irreparable harm or damage to life, including aquatic life, to property, to cultural resources, to valuable mineral deposits, or to the environment, or for noncompliance with applicable laws, regulations, the terms and conditions of the permit, OCS Orders, or any other written order or rule, including orders for submitting reports, well records or logs, and analyses in a timely manner.

§ 251.21 Penalties.

Any person who conducts geological and geophysical exploration of the Outer Continental Shelf without a permit issued under this part or who, having obtained a permit, fails to comply with the terms of the permit will be subject to any civil or criminal remedies which the Secretary chooses to pursue.

§ 251.22 Appeals.

Orders or decisions issued under the regulations in this part may be appealed as provided in Part 290 of this chapter.

[FR Doc.75-10499 Filed 4-21-75;8:45 am]

DEPARTMENT OF TRANSPORTATION

Coast Guard

[33 CFR Part 175]

[CGD 74-189]

NONAPPROVED LIFESAVING DEVICES ON WHITE WATER CANOES AND KAYAKS

Proposed Revocation of Exception; Comment Period Extension

In the February 4, 1975 issue of the FEDERAL REGISTER (40 FR 5167), the Coast Guard published a Notice of Proposed Rulemaking proposing to revoke the exception in 33 CFR 175.17 from Personal Flotation Device (PFD) requirements presently allowed for operators of white water canoes and kayaks. The notice provided that all written comments received before April 17, 1975 would be considered before action would be taken on the proposal.

The purpose of this notice is to extend the comment period to May 31, 1975 in order to give the public additional time to submit written data, views, and arguments concerning the notice.

All communications received before May 31, 1975 will be considered before action is taken on the proposed revocation.

(Sec. 5 of the Federal Boat Safety Act of 1971 (46 U.S.C. 1454); 49 CFR 1.46(o)(1))

Dated: April 16, 1975.

A. F. FUGARO,
Captain, U.S. Coast Guard,
Acting Chief, Office of Boating Safety.

[FR Doc.75-10470 Filed 4-21-75;8:45 am]

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 450]

[FRL 361-7]

EFFLUENT GUIDELINES AND STANDARDS

Pretreatment Standards for Oil and Grease; Request for Public Comments

During the past several months EPA has proposed pretreatment standards for existing sources which discharge into publicly owned treatment works and promulgated pretreatment standards for new sources which discharge into publicly owned treatment works, pursuant to section 307 (b) and (c) of the Federal Water Pollution Control Act, 33 U.S.C. section 1317.

Internal review of these regulations by EPA has led to the conclusion that additional consideration should be given to the question of the proper pretreatment standard for the discharge of oil and grease for all industrial categories. The Agency has compiled additional data concerning this question. This data is summarized and analyzed in a document entitled "Treatability of Oil and Grease."

These data appear to indicate that no pretreatment limitation should be placed on the discharge of oil and grease of an animal or vegetable origin where such wastes are essentially free from petroleum or mineral based oil and greases. On the other hand, where the oil and grease is known to be derived from petroleum or mineral sources or where the source is unknown a pretreatment standard limitation of 100 mg/l on oil and grease appears to be most appropriate. The Agency is presently considering inclusion of these limitations in pretreatment standards for all industrial categories. However before doing so, the Agency desires to hear the views of publicly owned treatment plant operators, industrial users and all other interested parties.

Information concerning the data which supports the above conclusions and pertinent definitions and methodology are contained in the above mentioned document. Copies of this document are available through the Office of Public Affairs, Environmental Protection Agency, Washington D.C. 20460, Attention: Ms. Ruth Brown, A-107.

Interested persons may submit written comments in triplicate to Ms. Ruth Brown, Office of Public Affairs, at the above address. Comments on all aspects of this request for public participation are solicited. In the event comments are in the nature of criticisms as to the adequacy of data which is available, or which may be relied upon by the Agency, comments should identify and, if possible, provide any additional data which may be available and should indicate why such data is essential to the development of the regulations.

In the event comments address the approach taken by the Agency in establishing pretreatment standards for existing sources, EPA solicits suggestions as to what alternative approach should be taken and why and how this alternative better satisfies the detailed requirements of section 307(b) of the Act.

A copy of all public comments will be available for inspection and copying at the EPA Freedom of Information Center, Room 204, West Tower, Waterside Mall, 401 M Street SW., Washington, D.C. 20460. The EPA information regulation, 40 CFR 2, provides that a reasonable fee may be charged for copying.

All comments received on or before May 22, 1974, will be considered.

Date: April 15, 1975.

RUSSELL E. TRAIN,
Administrator.

[FR Doc.75-10478 Filed 4-21-75;8:45 am]

APPENDIX 5
POLLUTANT INTERFERENCE DATA

Effect on Biological Treatment Processes

Table & Figure No.	Pollutant
5-1	Ammonia
5-2	Arsenic
5-3	Borate (Boron)
5-4	Cadmium
5-5	Chromium
5-6	Copper
5-7	Cyanide
5-8	Iron
5-9	Lead
5-10	Manganese
5-11	Mercury
5-12	Nickel
5-13	Silver
5-14	Sulfate
5-15	Sulfide
5-16	Zinc

TABLE 5-1

DATA SUMMARY

EFFECT OF AMMONIA
ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
10	N				E-29
100	N				E-29
5-200		B			E-29
480	I				E-29
200-1000		N			E-29
1500-3000		I			E-17, E-20
3000		U			E-11

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-1
EFFECT OF AMMONIA
ON BIOLOGICAL TREATMENT PROCESSES

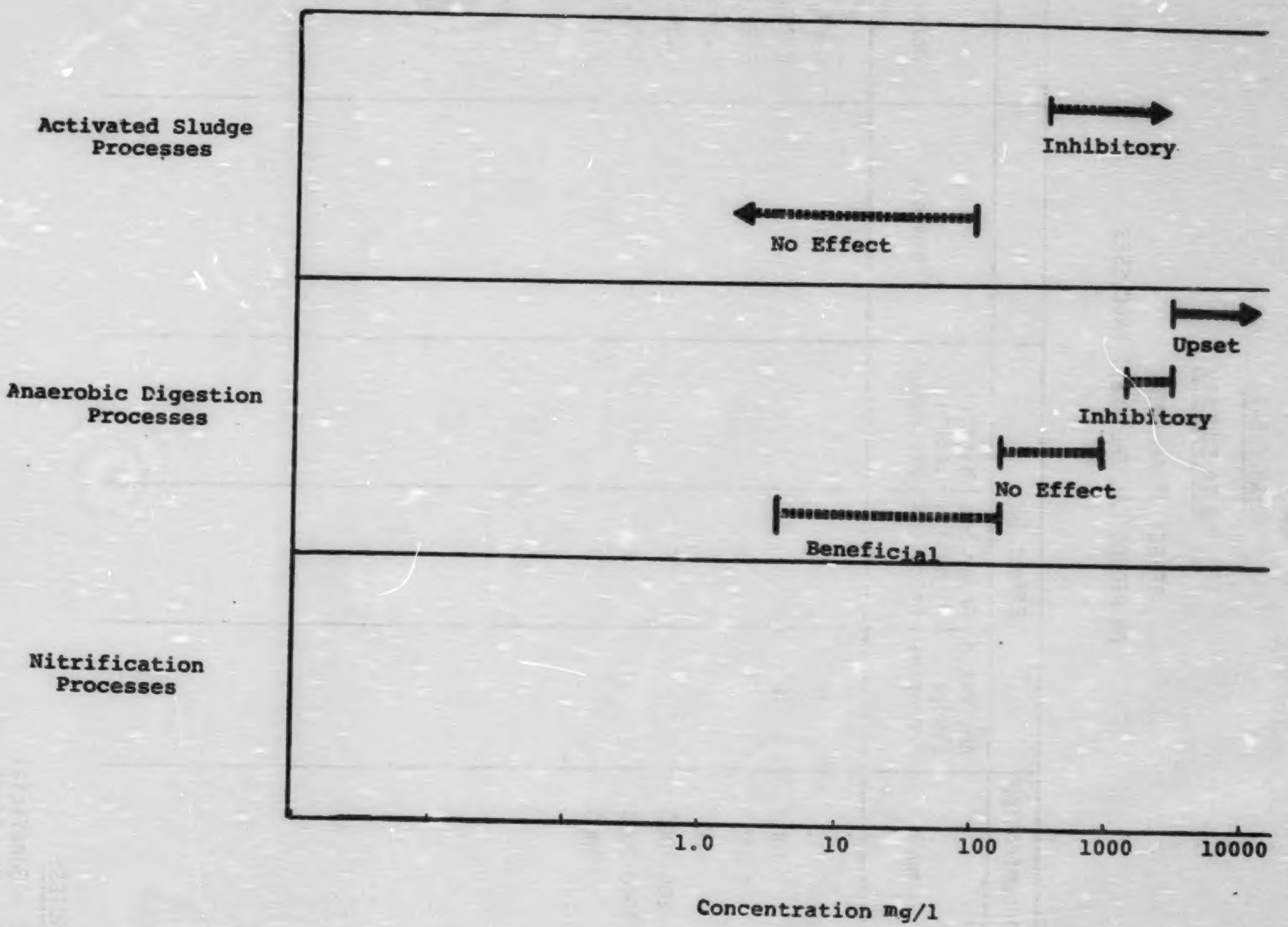


TABLE 5-2

DATA SUMMARY

EFFECT OF ARSENIC
ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.1	N			Meta-Arsenate	E-29
0.1	I			$AsCl_3$	E-21
1.0	I				E-21
1.6		I		4 mg/l Sodium Arsenate	E-5

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset

Concentrations represent influent to the unit processes.

FIGURE 5-2

EFFECT OF ARSENIC
ON BIOLOGICAL TREATMENT PROCESSES

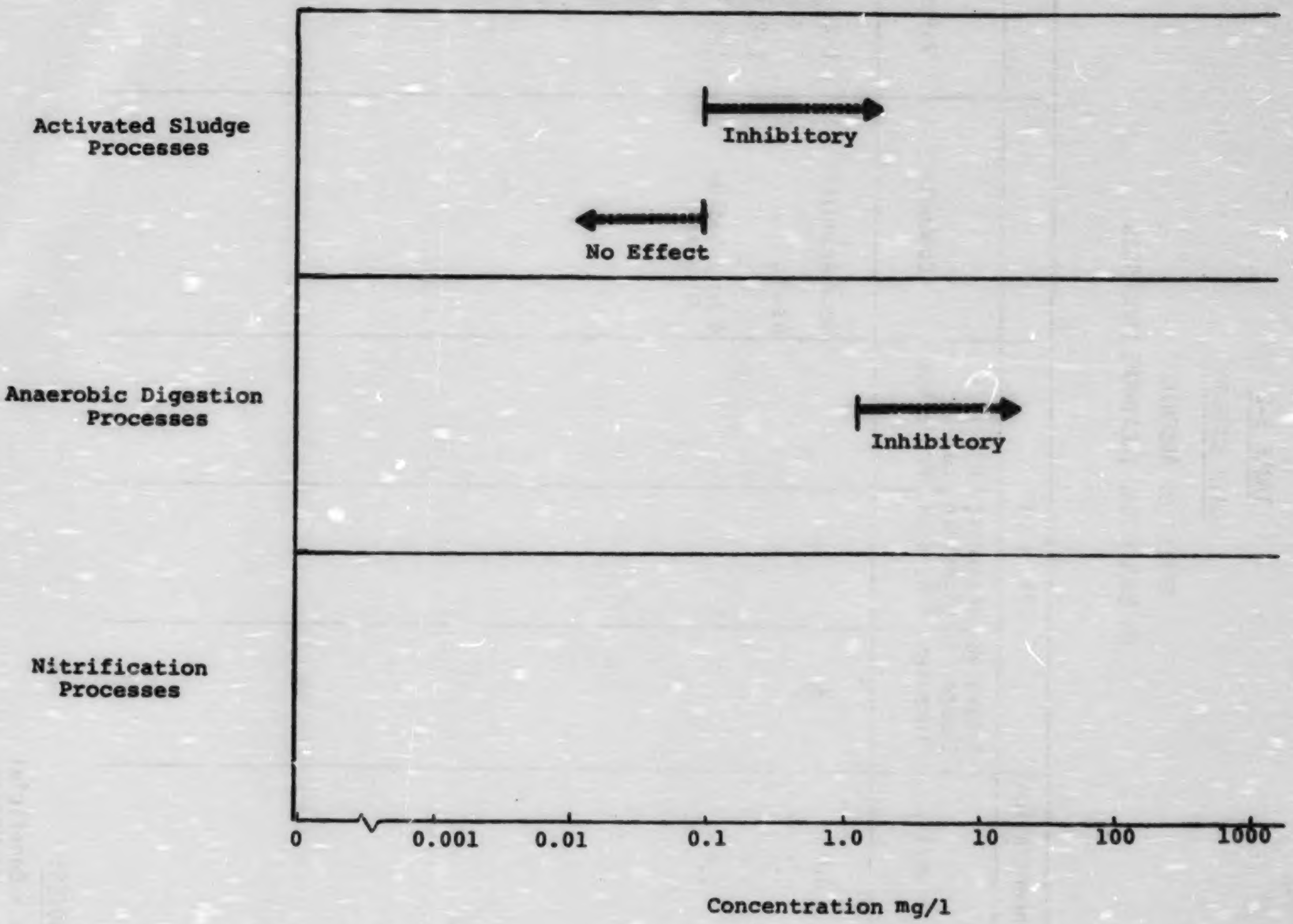


TABLE 5-3

DATA SUMMARY

EFFECT OF BORATE (BORON) ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.005 - 0.05	N				E-29
0.05	I				E-5, E-29
0.4	N				E-8, E-9
2		I			E-128
7.4	N			50 mg/l Sodium Tetra-Borate	E-8
10	I				E-9, E-29, E-44
50	I				E-29
74	I			500 mg/l Sodium Tetra-Borate	E-8
100	I				E-44
740	U			5000 mg/l Sodium Tetra-Borate	E-8

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-3
EFFECT OF BORON
ON BIOLOGICAL TREATMENT PROCESSES

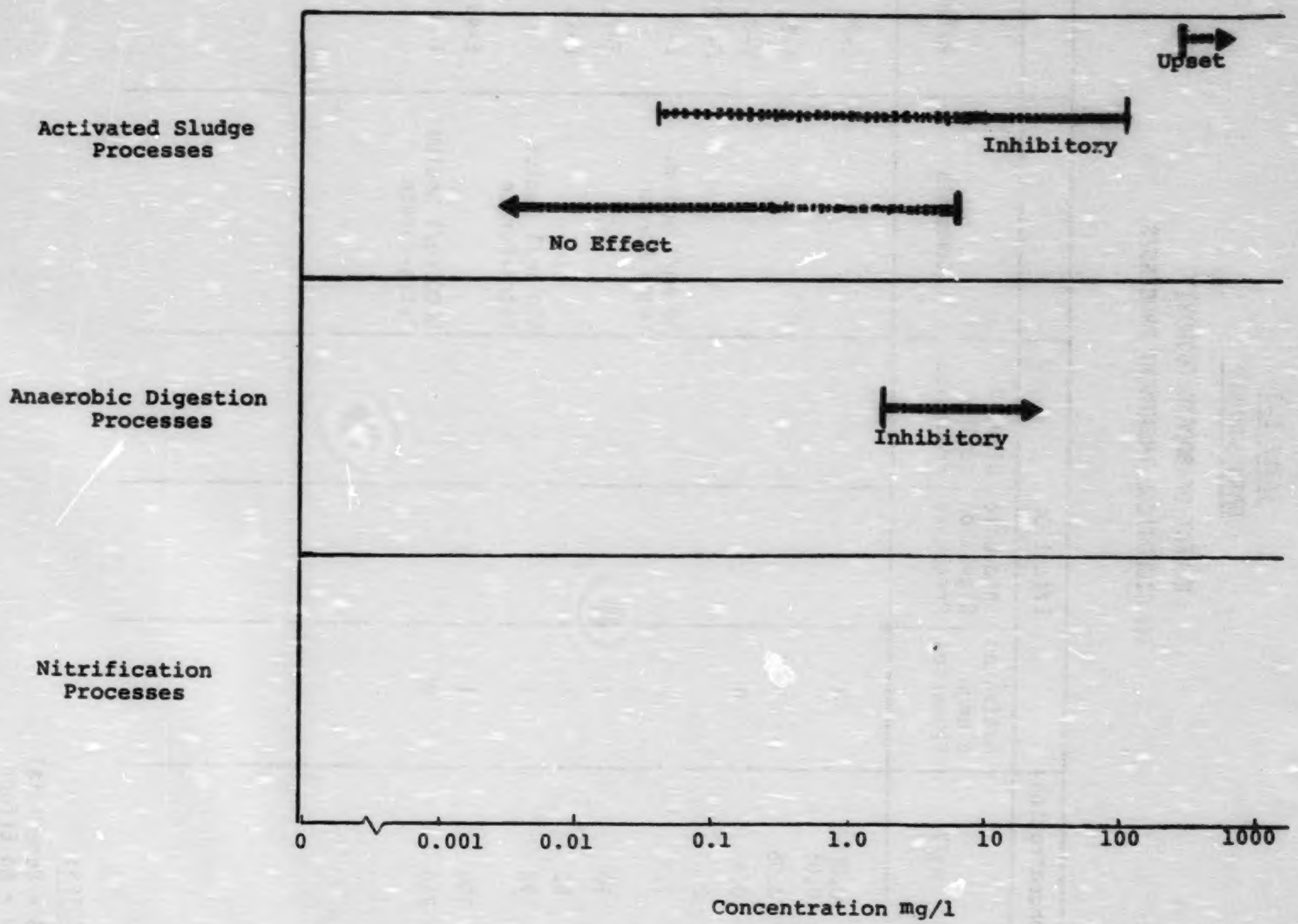


TABLE 5-4

DATA SUMMARY

EFFECT OF CADMIUM
ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.02		T			E-104
1	T				E-21
10 - 50	I				E-29
60	U				E-29
100	T				E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-4

EFFECT OF CADMIUM
ON BIOLOGICAL TREATMENT PROCESSES

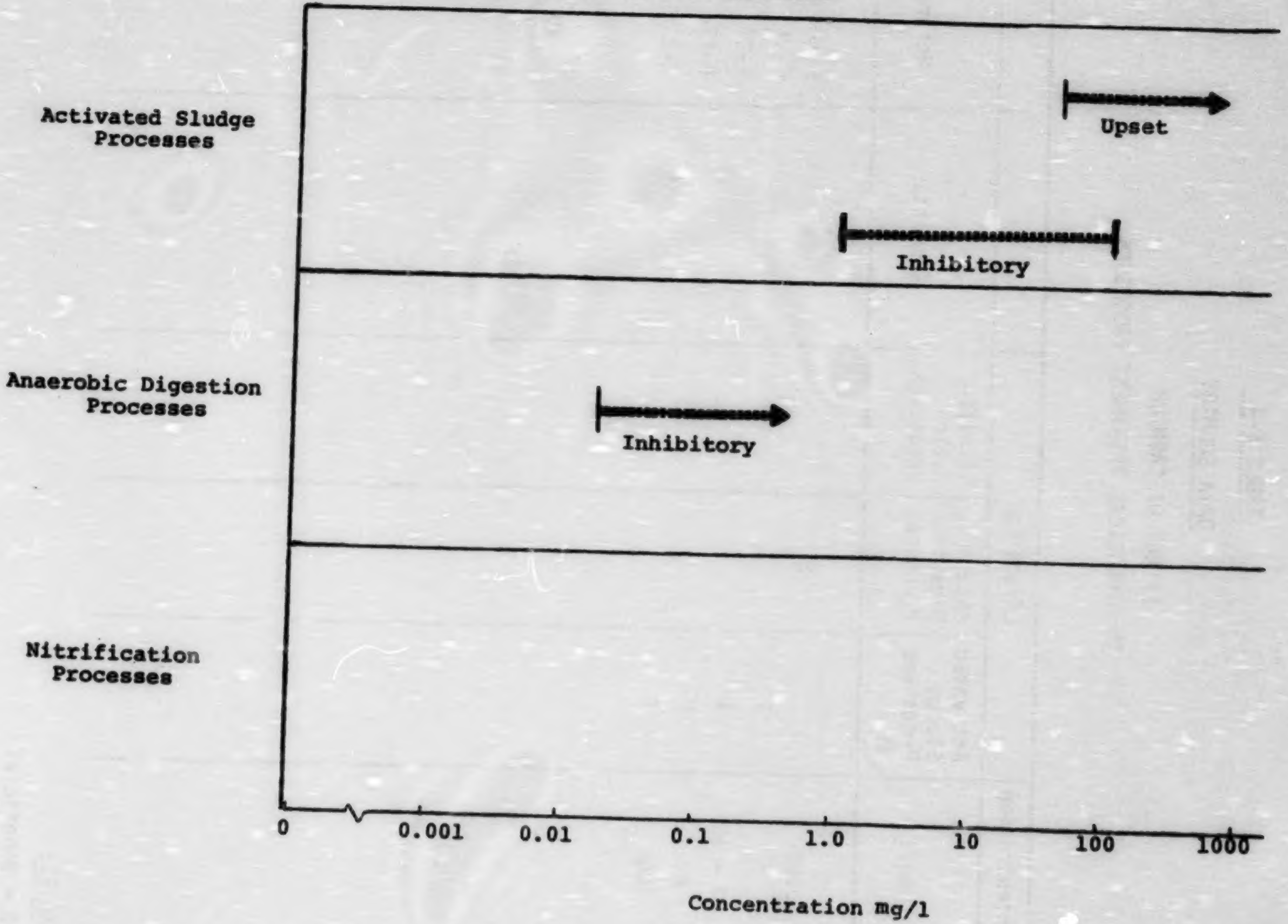


TABLE 5-5

DATA SUMMARY

EFFECT OF CHROMIUM
ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.005-0.05	B				E-5
0.25			I		E-119
1	N				E-5
1	I			$K_2Cr_2O_7$	E-5
1	T				A-1
1.5		T			A-1
2.5			U		E-13, E-29, E-117
5			U		A-1
5		T			A-1
7	I			25% Loss in BOD Removal	A-1
8.8	I			25 mg/l $K_2Cr_2O_7$	E-8
5-10	I				E-29, E-78
10	T				E-29, E-78
10	I			29% Loss in BOD Removal	E-28
15			I	Cr III	E-29
4			I		E-17
0-50				Cr III, No Effect on Trickling Filter Operation	E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

TABLE 5-5 (continued)

DATA SUMMARY

EFFECT OF CHROMIUM ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
50	I			3% Loss in BOD Removal	E-118
50	I				E-88
50		N			E-3
50		U			E-118, E-78
100			I	Reduced Nitrification by 66-78%	E-5
100	I			3% Loss in BOD Removal	E-118
300			I		E-118
300		U			E-118
500		U			E-118
500		U			E-29
430 + 1440			U		E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-5

EFFECT OF CHROMIUM
ON BIOLOGICAL TREATMENT PROCESSES

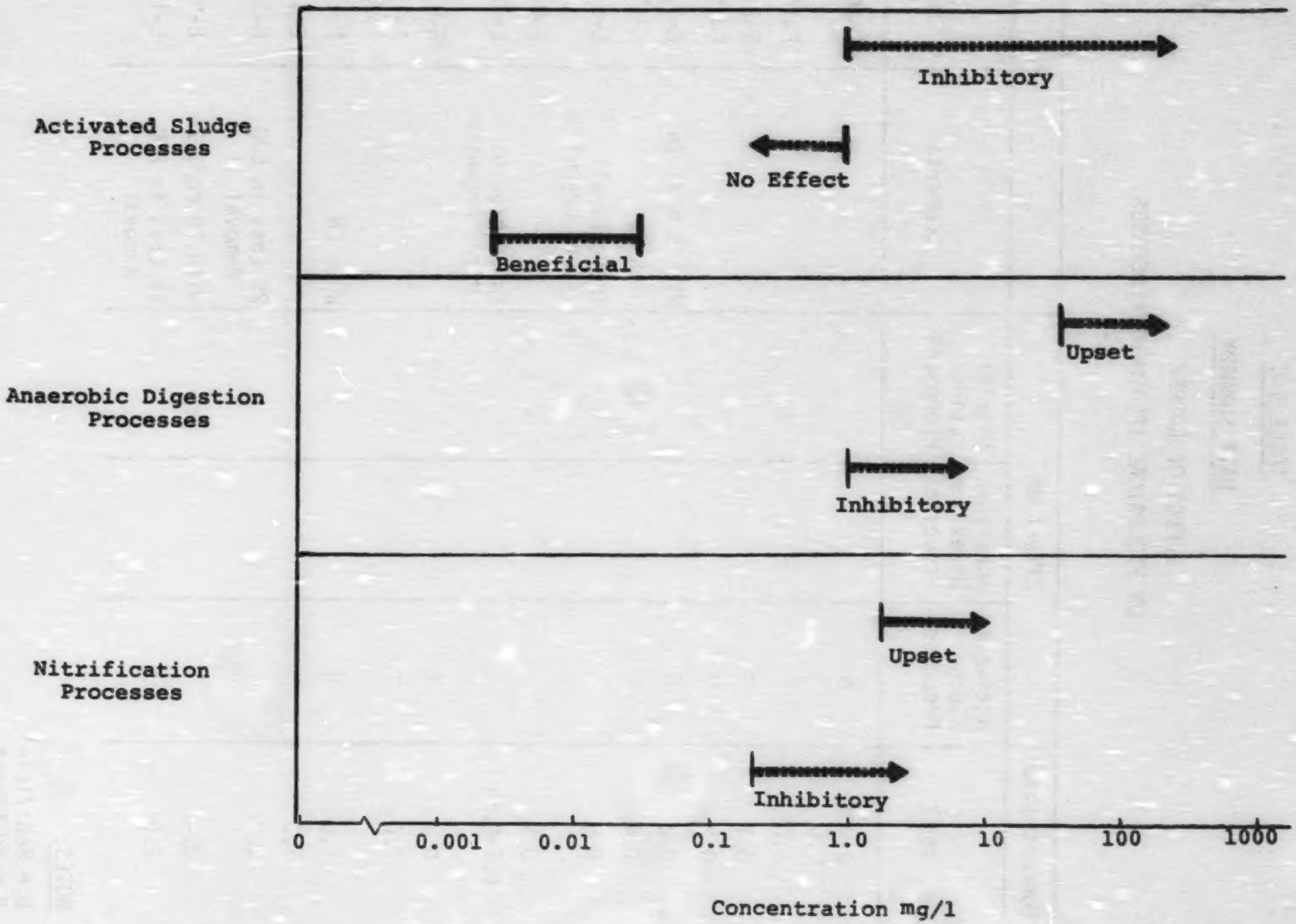


TABLE 5-6

DATA SUMMARY

EFFECT OF COPPER ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.005-0.05	B				E-29
0.05			I		E-100
0.1	T				E-2
0.2	T				E-33
0.2	N			With 5 mg/l Zn	E-5, E-29
0.4	N			With CN	E-118
0.5				Toxic to all Micro Organisms	E-5
0.5			I		E-2
0.5-0.56				Inhibition of Micro Organisms	E-29
0.7	T				E-1
1.0	T				A-1,E-2,E-5,E-24,E-29,E-78,E-109
1.0	N			With CN	E-29
1.0		T			E-5, E-15
1.2	I			2% Loss in BOD Removal	E-118
2.4		U		With 20 mg/l Zn	E-5, E-29
2.5	I			4% Loss in BOD Removal	E-118

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

TABLE 5-6 (continued)

DATA SUMMARY

EFFECT OF COPPER ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
3.6	U			With 8.6 mg/l CN	E-16
4	I				E-29
5	I				E-29
5		N			E-118
5	I			6% Loss in BOD Removal	E-118
10	I			3.6% Loss in BOD Removal	E-118
10	I			With CN 7% Loss in BOD Removal	E-118
10	N				E-29
1-10	T				E-29
10		N			E-118
10		T		With CN	E-118
10	I			With 100 mg/l CN	E-29
10	I			With 10 mg/l Ni	E-29
10	I			With 100 mg/l $CrO_4^=$	E-29
10	I			With 100 mg/l Fe	E-29
15	I			5.3% Loss in BOD Removal	E-118
15		I			E-118

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

TABLE 5-6 (continued)

DATA SUMMARY

EFFECT OF COPPER ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
15	I				E-129
25		I			E-118
25	I			With CN 2.5% Loss in BOD Removal	E-118
30	I				E-29
45	I				E-43
50	I				E-29
50		I			E-29
64	I				E-118
75	I				E-29
100	I				E-2, E-118
210	U				E-118
410	U				E-118
1000		I		Cuprous 14.9% Loss in Gas Production	E-29
1000		I		Cuprous 49.4% Loss in Gas Production	E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset

Concentrations represent influent to the unit processes.

FIGURE 5-6
EFFECT OF COPPER
ON BIOLOGICAL TREATMENT PROCESSES

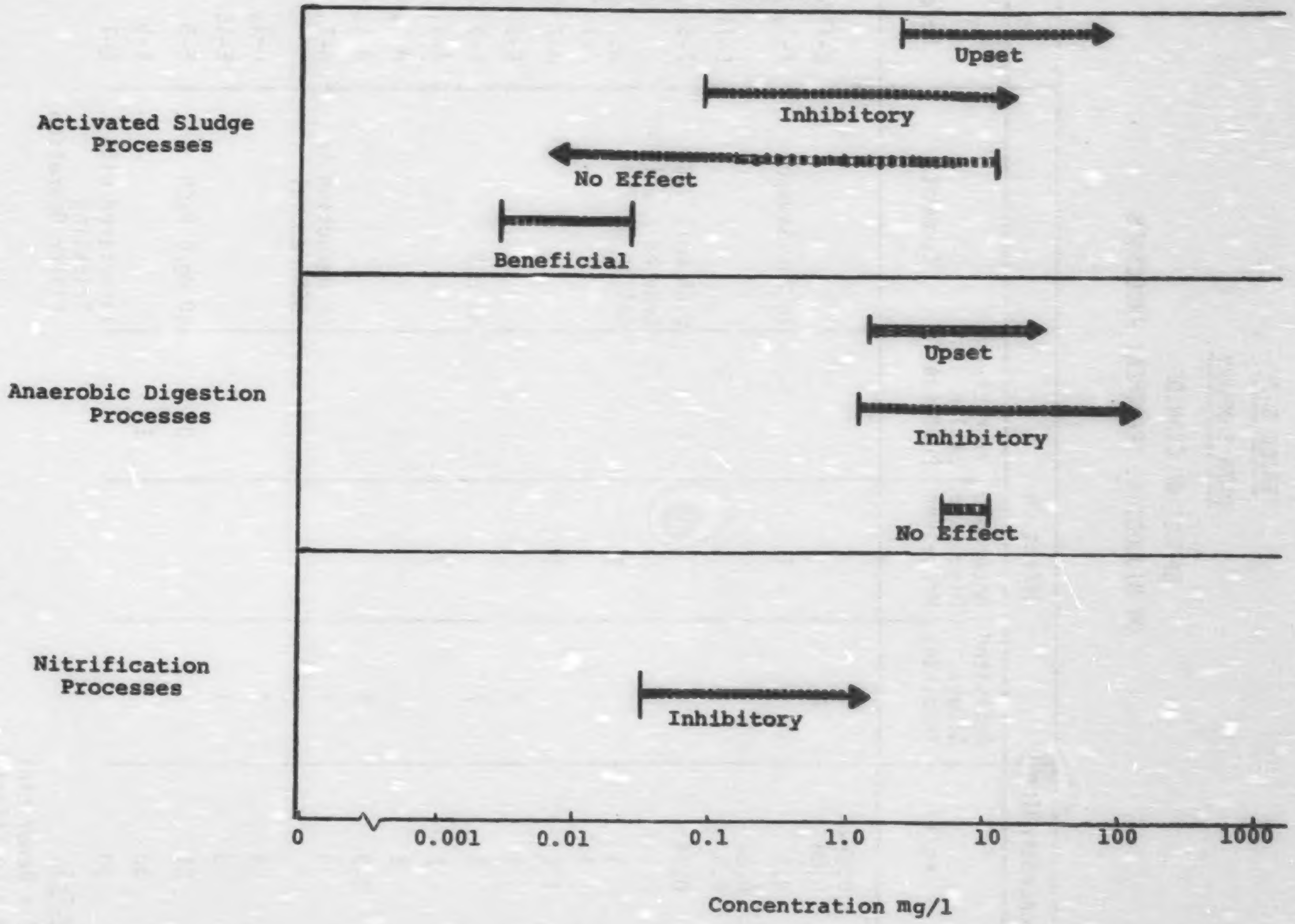


TABLE 5-7

DATA SUMMARY

EFFECT OF CYANIDE
ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.01-0.05	N				E-118
0.1		T		In Raw Sewage	A-1, E-5,
0.3-0.5	I				E-21
0.34			I	0.65 mg/l N_aCN Reduced Nitrification by 75%	E-5
1		T			A-1
1	T				A-1
1.6		T			A-1
2	T				E-5
2	I			As HCN	E-5
2		T			A-1, E-5
2			I		A-1, E-5
2-3	I				A-1, E-5
3	I			5% Reduction in BOD Removal	A-1, E-5
4	I				A-1, E-5
5	I				E-15
21			U	40 mg/l N_aCN	E-5
30			I		E-5
30				Interfered with Trickling Filter Operation	E-7

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

TABLE 5-7 (continued)

DATA SUMMARY

EFFECT OF CYANIDE ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
40	I				E-29
100		U			E-5
100	I			With 10 mg/l cu	E-29
100	I			With 10 mg/l Ni	E-29
480	U			480 mg/l KCN	E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-7

EFFECT OF CYANIDE

ON BIOLOGICAL TREATMENT PROCESSES

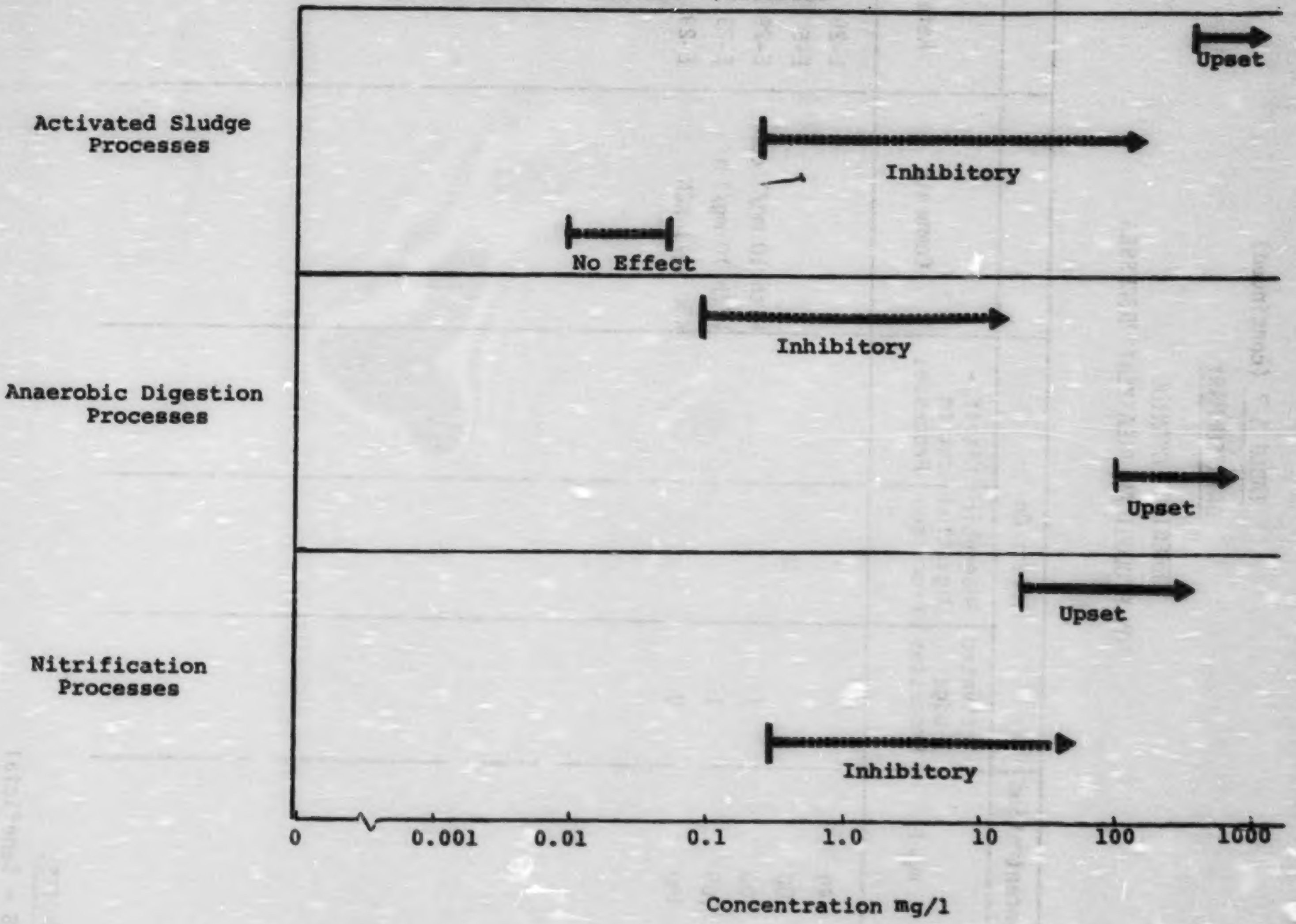


TABLE 5-8

DATA SUMMARY

EFFECT OF IRON
ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0		I		Lack of Iron Inhibits Digestion	E-39, E-112
0	I			Lack of Iron Reduces Metabolism	E-39, E-112
5	T				E-5
5		T			A-1
5-20		I		Due to Acidity	E-5, E-118
100	N				E-21
1000	U				E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-8
EFFECT OF IRON
ON BIOLOGICAL TREATMENT PROCESSES

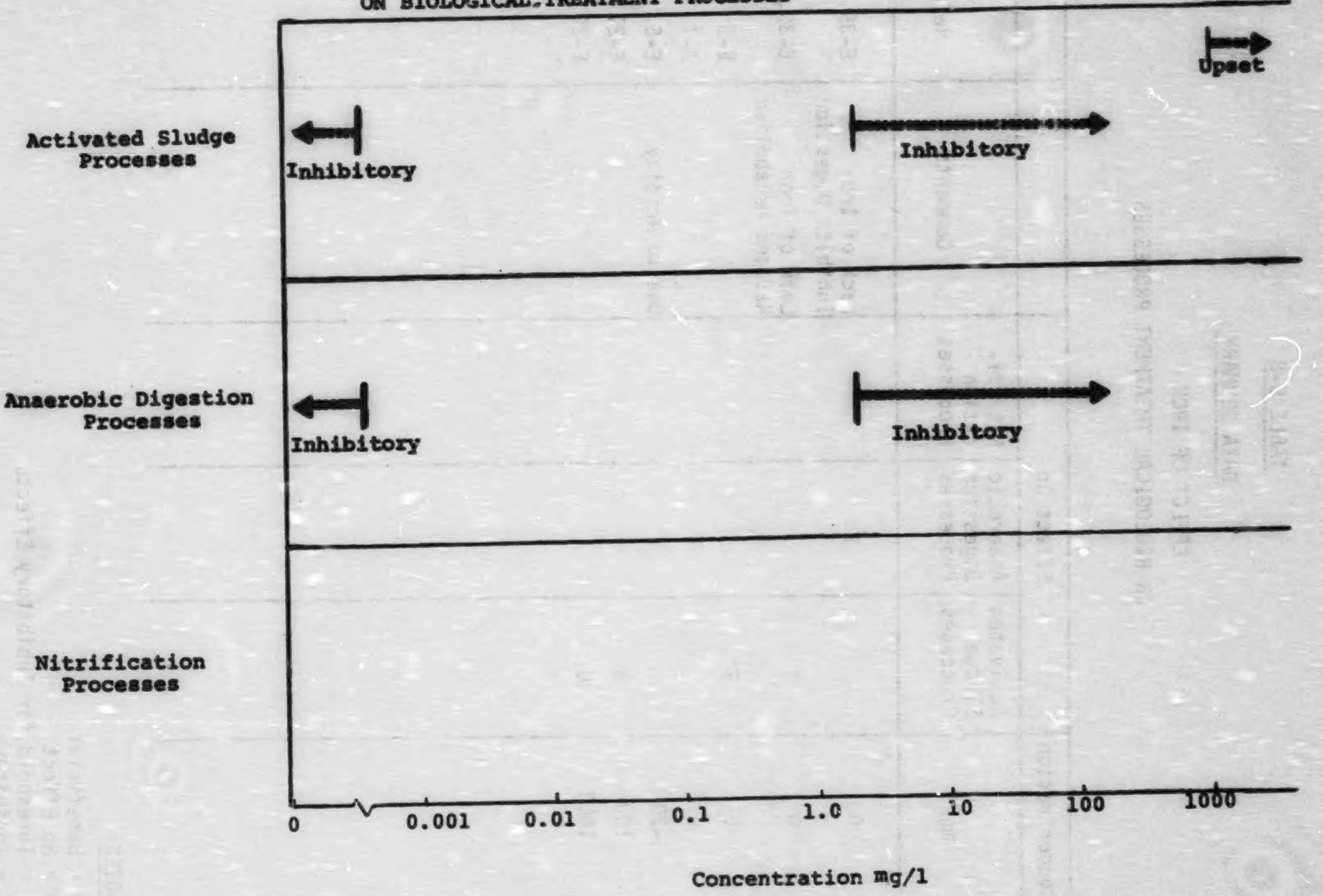


TABLE 5-9

DATA SUMMARY

EFFECT OF LEAD ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.005-0.05	N				E-5
0.05			N		E-100
0.5			I		E-5
0.1-1.0	I				E-5
50	N				E-21
10-100	I				E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset

Concentrations represent influent to the unit processes.

FIGURE 5-9
EFFECT OF LEAD
ON BIOLOGICAL TREATMENT PROCESSES

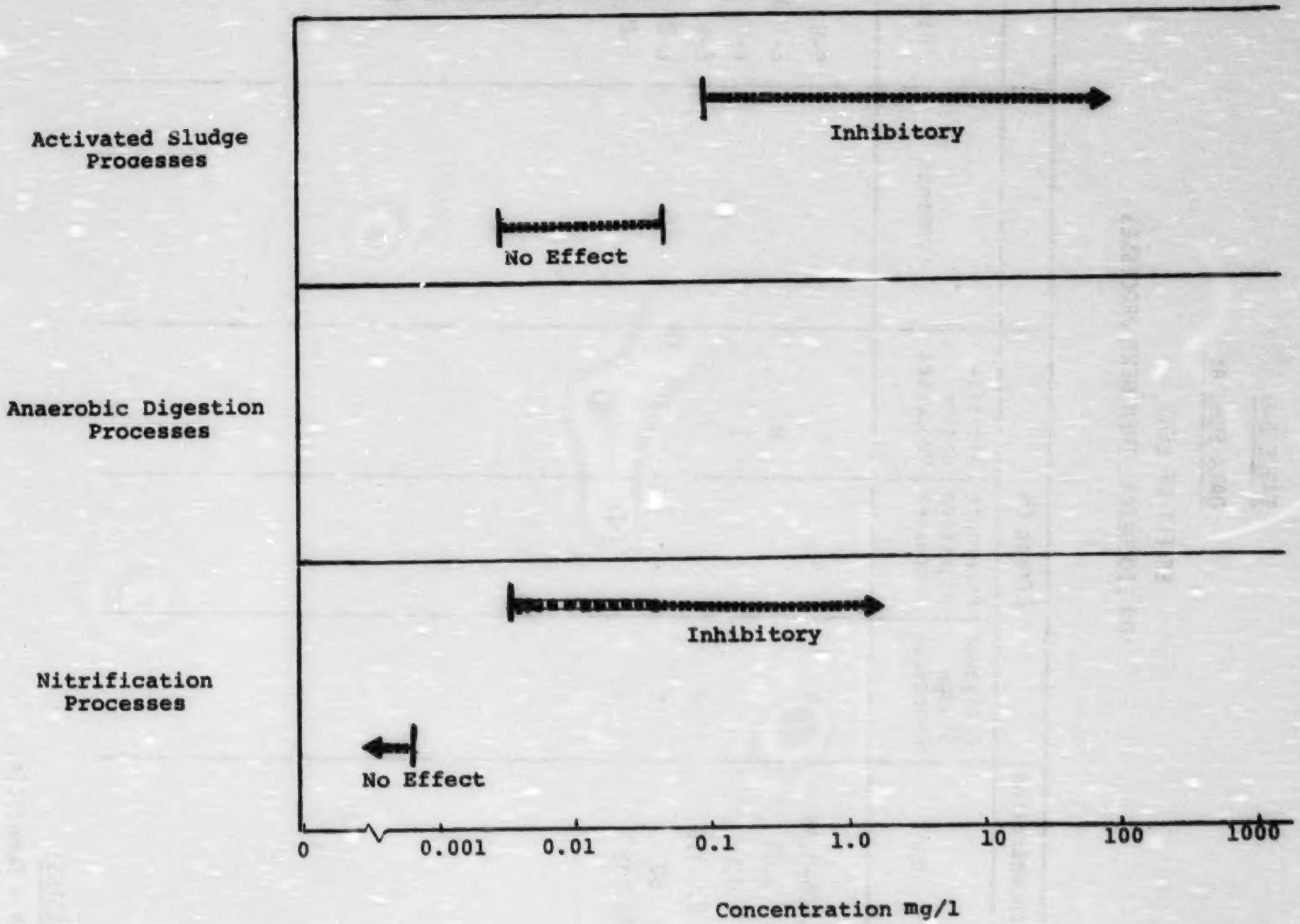


TABLE 5-10

DATA SUMMARY

EFFECT OF MANGANESE ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
7	N				E-29
10	I				E-29
50	U				E-21
12.5-50			B		E-29
50-100	I				E-29

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset

Concentrations represent influent to the unit processes.

FIGURE 5-10
EFFECT OF MANGANESE
ON BIOLOGICAL TREATMENT PROCESSES

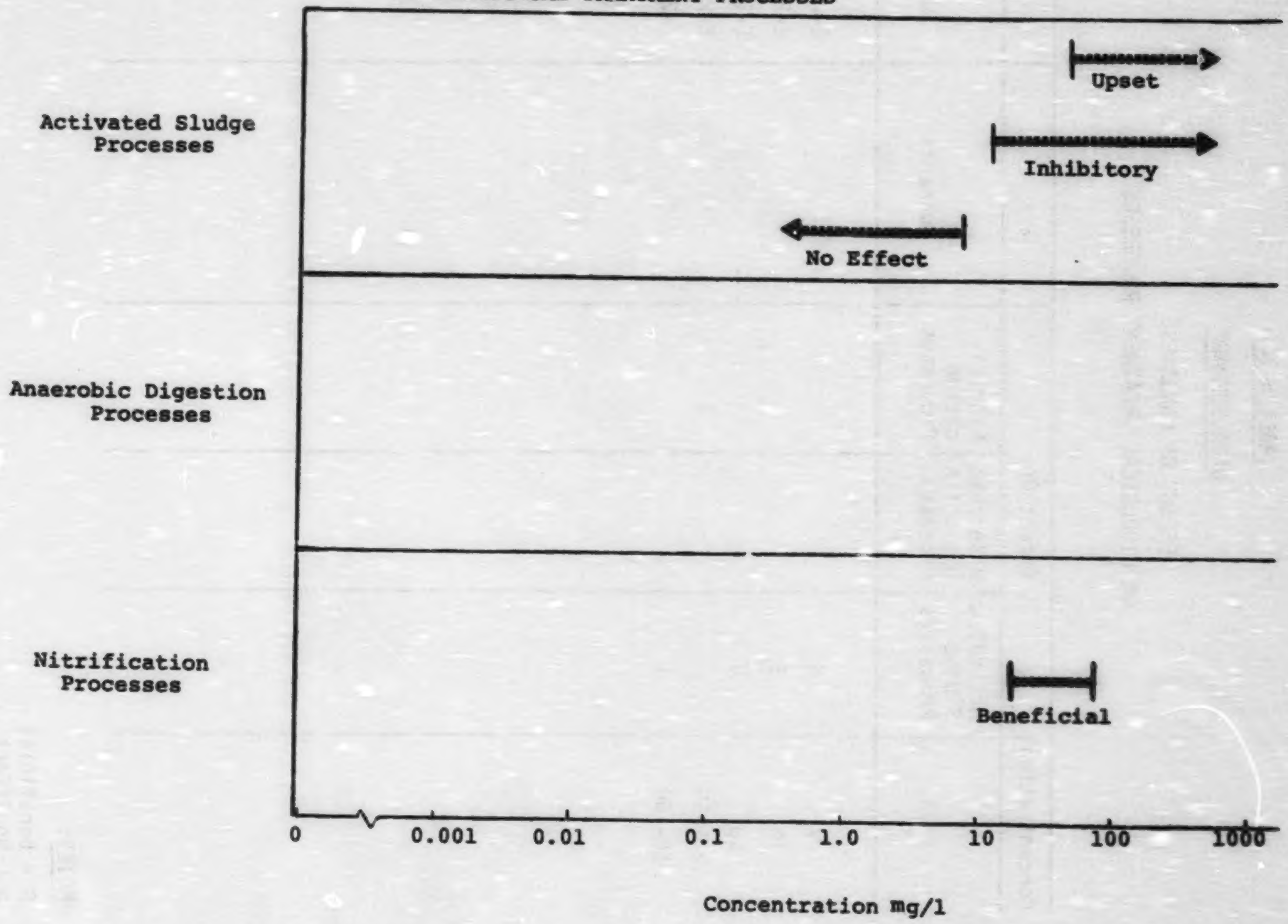


TABLE 5-11

DATA SUMMARY

EFFECT OF MERCURY ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.1 - 1.0	I				E-28
1.0	I				E-28
1.0	I				E-29
2.5	T				E-21
2.5	I				E-29, E-122
2.5-5	T				E-29
5	I				E-70
5	I			14% Loss in COD Removal	E-122
5	I			40% Loss in COD Removal	E-29
10	I			59% Loss in COD Removal	E-29
43		N			E-18
50	I				E-29
200	U				E-29
1365		I			E-18

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-11
EFFECT OF MERCURY
ON BIOLOGICAL TREATMENT PROCESSES

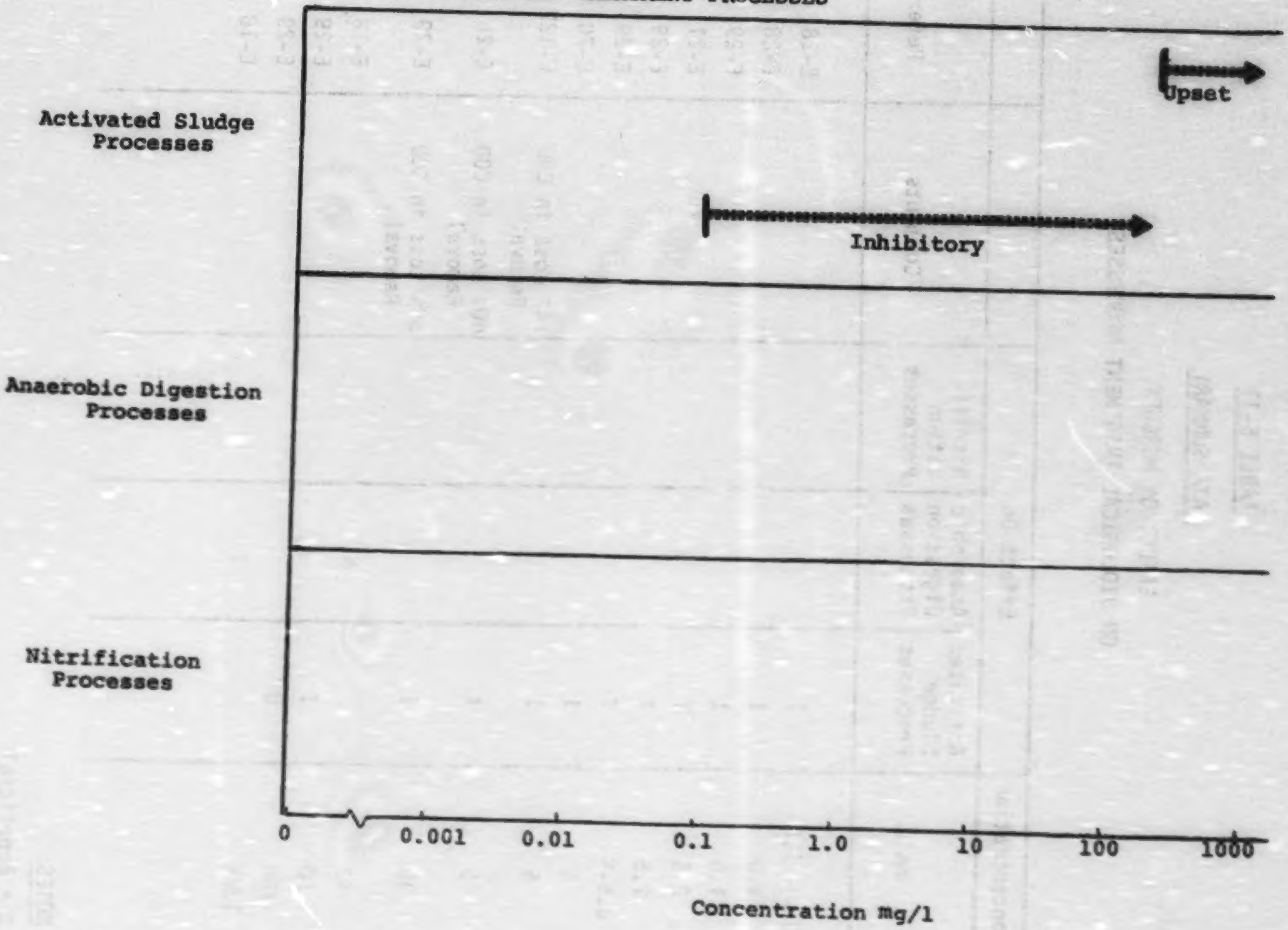


TABLE 5-12

DATA SUMMARY

EFFECT OF NICKEL ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
1	N				E-118
2		T			A-1
1-2.5	T				A-1
2.5	I			2.5% Loss in BOD Removal	E-118
0.5-3			I		E-25, E-118
5	I			5% Loss in BOD Removal	E-118
5	I				E-29
10	I			5% Loss in BOD	E-118
10			I		E-118
10		N			E-118
25	I				E-118
25	U				E-19
40		N			E-29
50	U				E-3
500		I		9.4% Reduction in Gas Production	E-5

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-12
EFFECT OF NICKEL
ON BIOLOGICAL TREATMENT PROCESSES

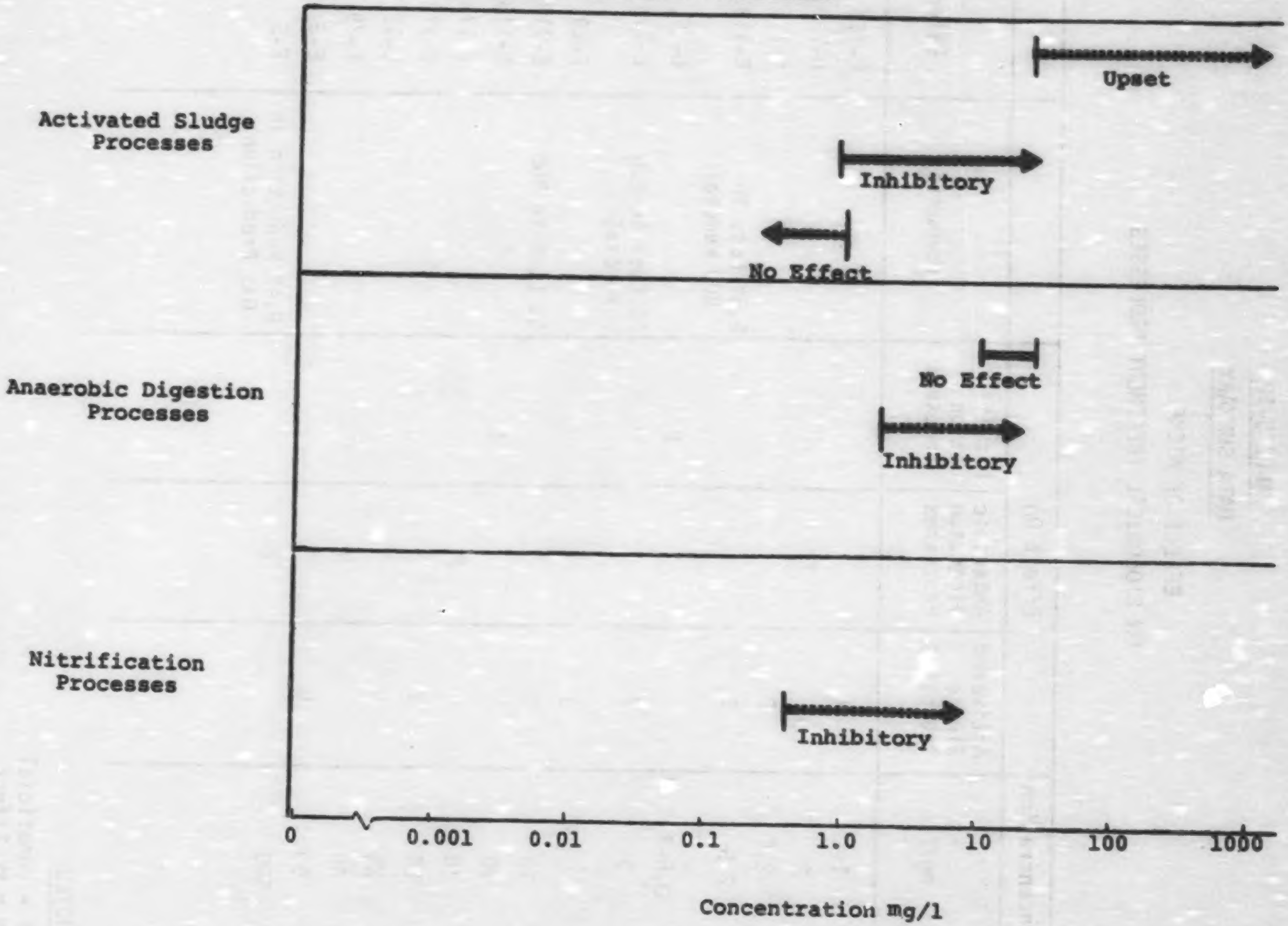


TABLE 5-13
DATA SUMMARY

EFFECT OF SILVER ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
5	I			84% Loss in BOD Removal	E-8, E-9
25	U				E-21
2-250	N			As Thiosulfate	E-8, E-9, E-120, A-1

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-13
EFFECT OF SILVER
ON BIOLOGICAL TREATMENT PROCESSES

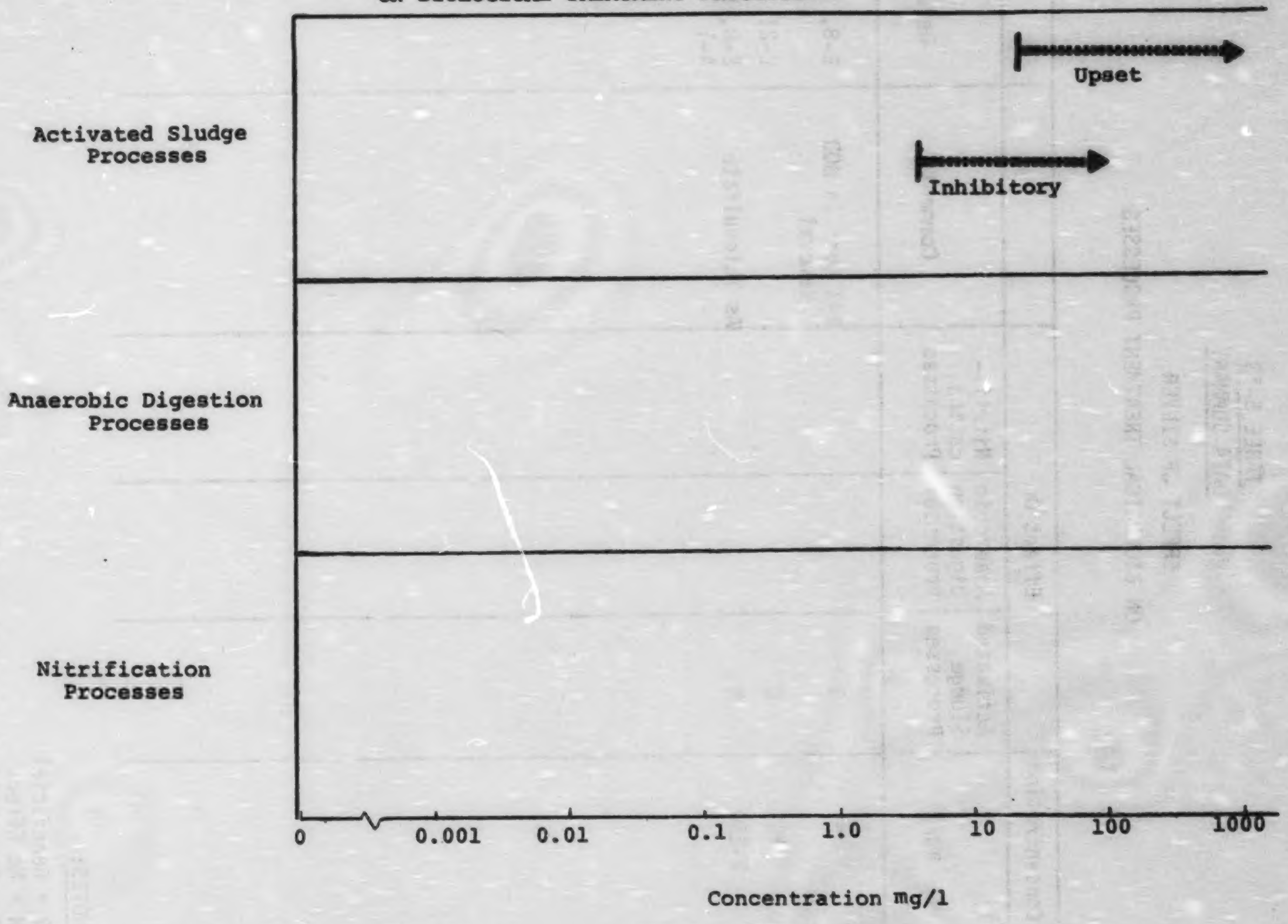


TABLE 5-14

DATA SUMMARY

EFFECT OF SULFATE ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
500		I			E-11, E-17
2400		I		12% Reduction in Gas Production	E-19
>2400		U			E-19

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset

Concentrations represent influent to the unit processes.

FIGURE 5-14
EFFECT OF SULFATE
ON BIOLOGICAL TREATMENT PROCESSES

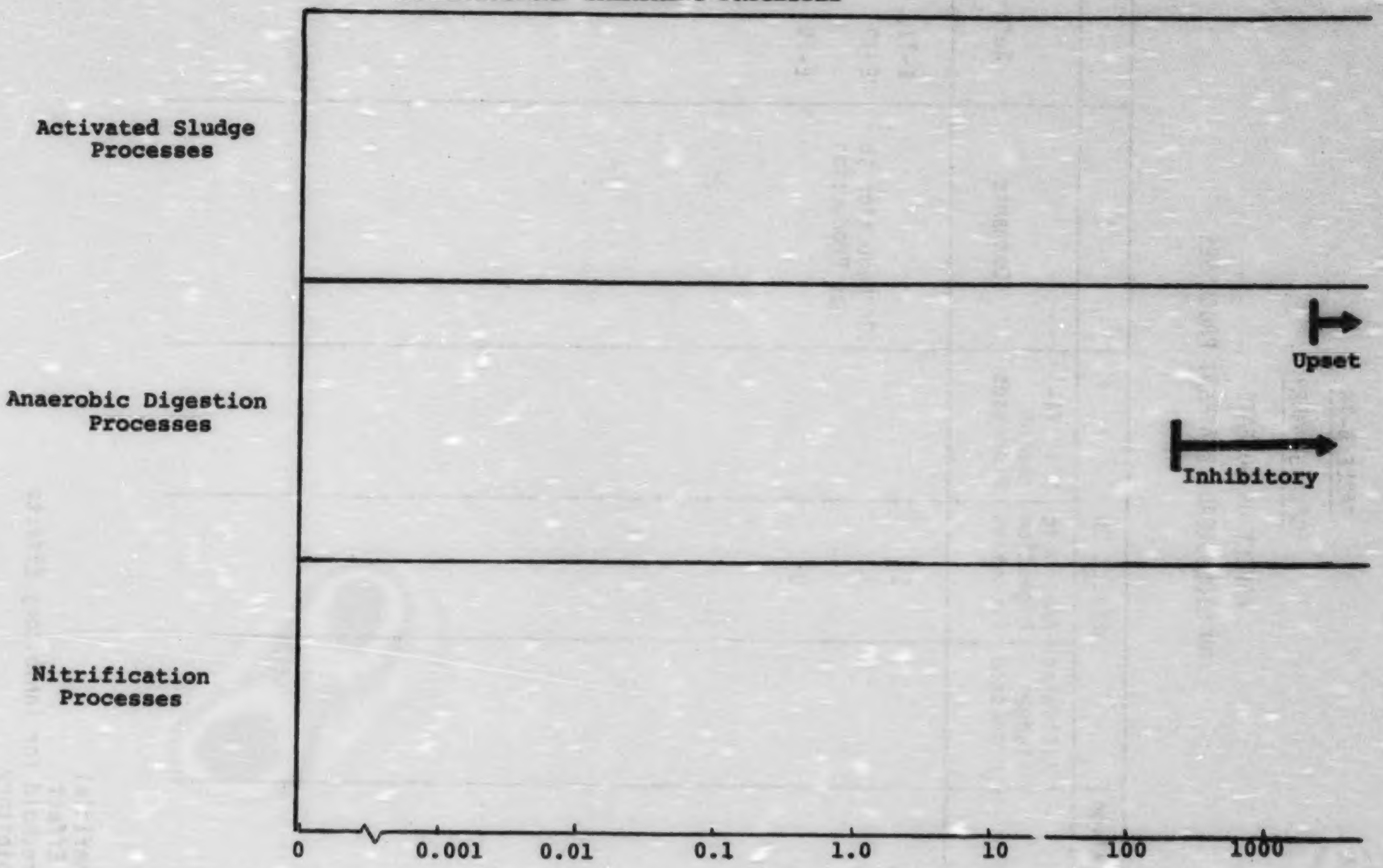


TABLE 5-15

DATA SUMMARY

EFFECT OF SULFIDE ON BIOLOGICAL TREATMENT PROCESSES

Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
25-50	I				E-35
50		I			E-20
50-100		N			E-120
100		I		50% Reduction in Gas Production	E-19
100		I		33% Loss in Gas Production	E-20
165		U			E-19
200		U			E-19
200		N		With Acclimation	E-35, E-120
200		I		80% Reduction in Gas Production	E-20
400		N		FeS	E-35
400		I		95% Reduction in Gas Production	E-20

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset
Concentrations represent influent to the unit processes.

FIGURE 5-15
EFFECT OF SULFIDE
ON BIOLOGICAL TREATMENT PROCESSES

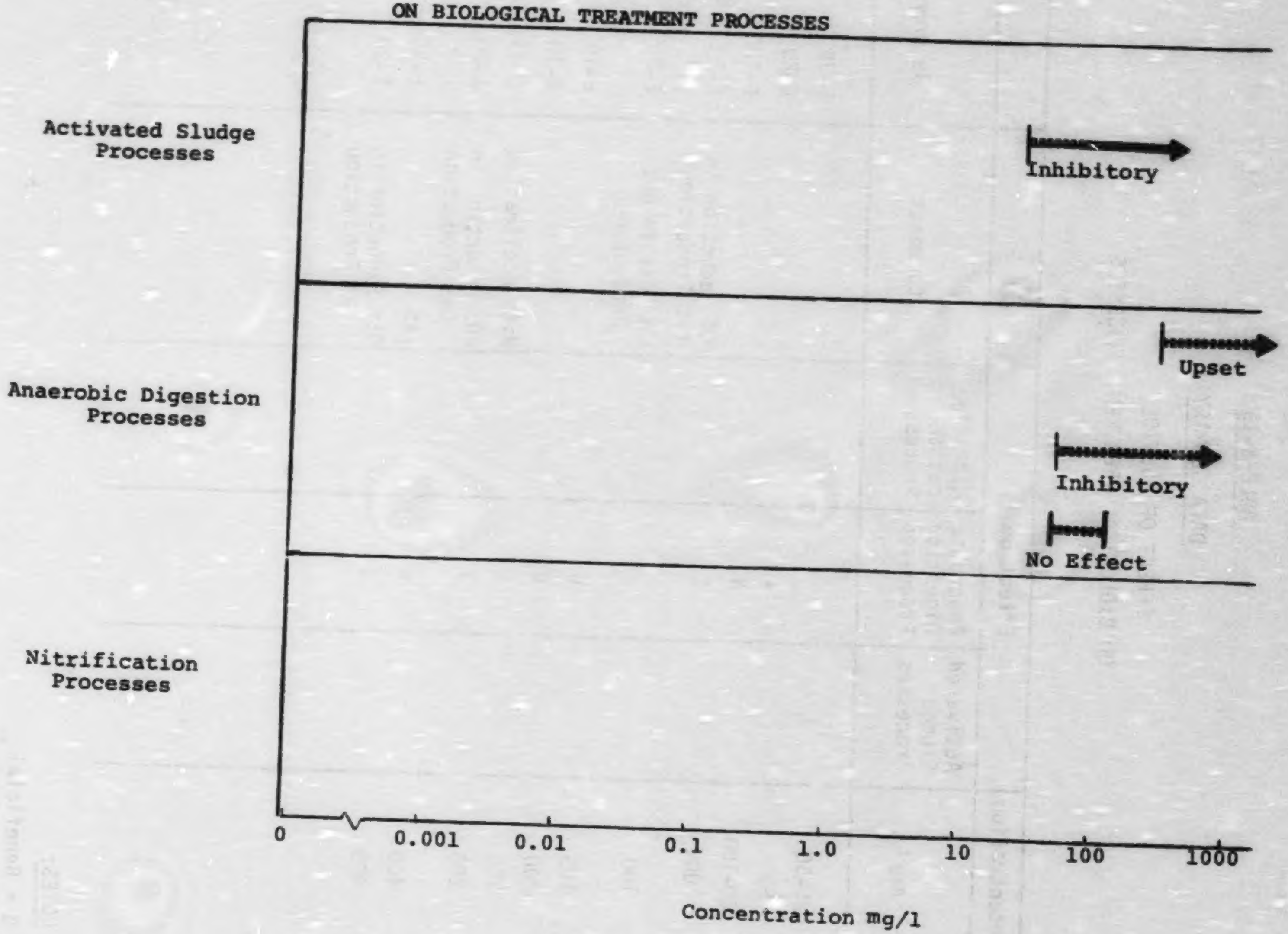


TABLE 5-16

DATA SUMMARY

EFFECT OF ZINC
ON BIOLOGICAL TREATMENT PROCESSES

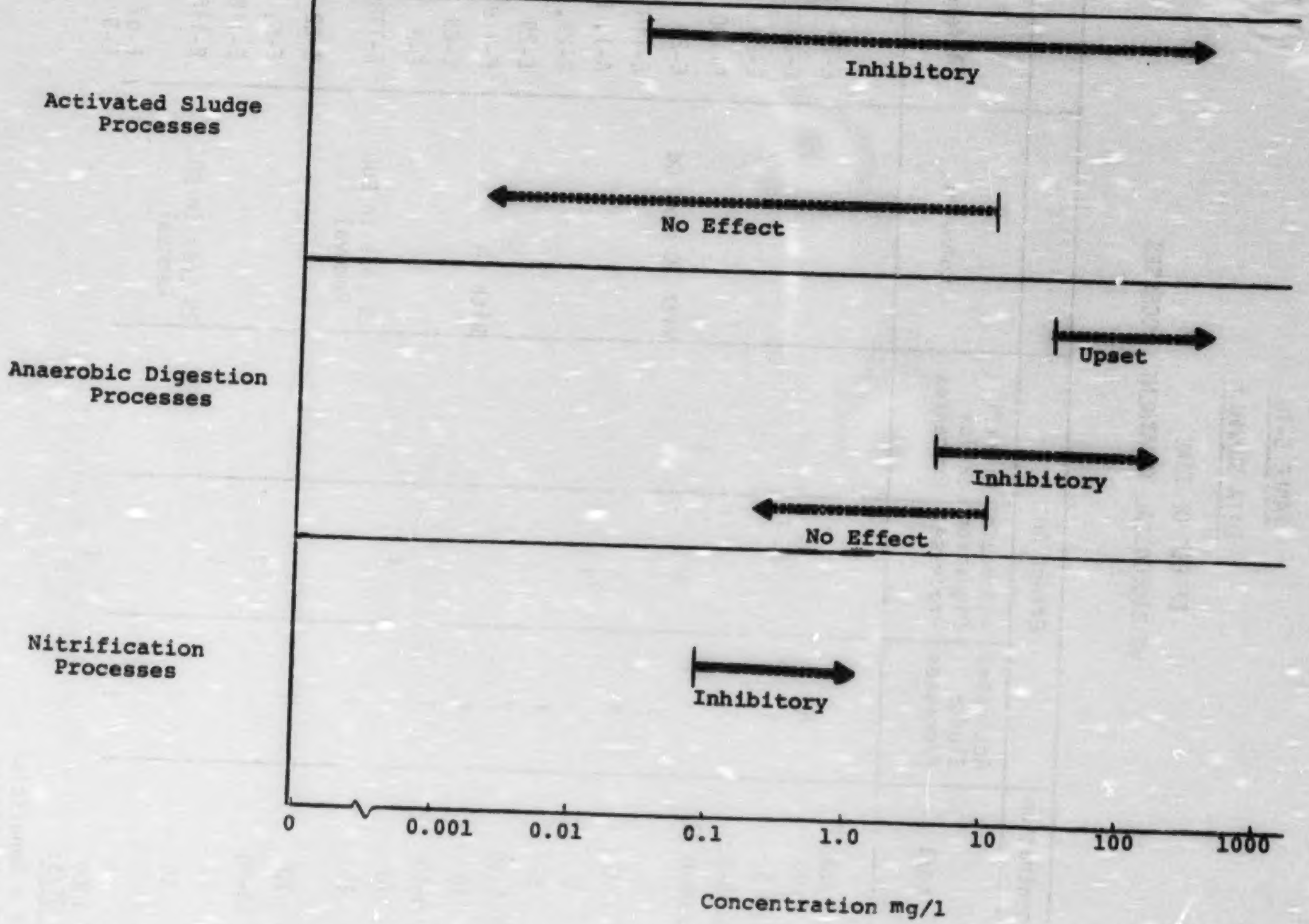
Concentration	Effect On				
mg/l	Activated Sludge Processes	Anaerobic Digestion Processes	Nitrification Processes	Comments	References
0.005-0.08	N				E-29
0.3	T				E-33
0.08-0.5	I				E-29
0.08-0.5			I		E-100
1	I			With 10 mg/l Cd	E-29
2.5	N				E-118
5		T			A-1, E-7
5	T				E-29, E-35
2.5-10	T				E-29
10	N			With CN	E-118
5-10	T				E-29
10		N			E-3
10	I			2% Loss in BOD Removal	E-118
10	N				E-22
10-20		T			E-6, E-78
20		U			E-118
20	I			2% Loss in BOD Removal	E-118
20	I				E-67
1000		I			E-5

NOTES:

B = Beneficial
N = No Effect
T = Threshold for Inhibitory Effects
I = Inhibitory
U = Upset

Concentrations represent influent to the unit processes.

FIGURE 5-16
EFFECT OF ZINC
ON BIOLOGICAL TREATMENT PROCESSES



APPENDIX 6
POLLUTANT REMOVAL AND PASS THROUGH DATA

Computer Report No. 1 - Summary of POTW Removal Data by EPA Region.

Computer Report No. 2 - POTW Categorization.

Computer Report No. 3 - POTW Removal Data, Reference Information.

Computer Report No. 4 - POTW Removal Data Analysis, 24 Hr. Composite - 6 Hr. Simultaneous Composite, Comparison of Results.

Computer Report No. 5 - POTW Removal Data Analysis, by Plant Category.

Computer Report No. 6 - Summary of POTW Removal Data.

Computer Report No. 7 - POTW Effluent Data Analysis.

Computer Report No. 8 - Summary of POTW Effluent Data.

Table 6-1 - Cumulative Frequency Distribution of Removal Data.

Table 6-2 - Cumulative Frequency Distribution of Effluent Data.

Evaluation of Limited Data

Table 6-3 - Removal and Effluent Data Summary for Oil and Grease, Cyanide and Hexavalent Chromium

Table 6-4 - Removal in Biological Plants with Chemical Addition, and Tertiary Plants

Table 6-5 - Removal in Biological and Secondary Treatment Plants

Correlation Analyses

APPENDIX 6
POLLUTANT REMOVAL AND PASS THROUGH DATA (continued)

Regression Analyses

Table 6-6 - Correlation Coefficient

Table 6-7 - Correlation Coefficient (Log)

Table 6-8 - Regression Analyses - Influent Conc. (X) vs. Effluent Conc. (Y)

REPORT NO. 1 SUMMARY OF POTW REMOVAL DATA BY EPA REGION DATE 5/15/75

PLANT TYPE

EPA REGION	A1	OTHER A	B1	OTHER B	C1	OTHER C	D,J,(MISC)	TOTAL
I	[illegible]	0	6	0	12	0	0	33
II	33	3	9	9	5	10	0	69
III	0	5	3	9	1	5	1	24
IV	5	2	5	9	3	4	5	33
V	14	0	14	11	23	19	6	87
VI	0	0	1	1	0	0	0	2
VII	4	0	6	1	6	2	0	19
VIII	0	0	0	0	0	0	0	0
IX	0	0	0	0	0	0	0	0
X	1	0	0	0	1	0	0	2
TOT	72	10	44	40	51	40	12	269

REPORT NO. 2 POTW CATEGORIZATION 5/15/75 DATE

CATEGORY	DESCRIPTION
A	PRIMARY SEDIMENTATION TREATMENT PROCESS
A01	CONVENTIONAL
A02	FLASH AERATION AHEAD OF CLARIFICATION
A03	CHEMICAL FLOCCULATION, CLARIFICATION
A04	LIME, FERRIC CHLORIDE ADDITION, PRIMARY SEDIMENTATION, CLARIFICATION
A05	PREAERATION, POLYMER ADDITION, PRIMARY SEDIMATION
B	TRICKLING FILTER
B01	A01, TRICKLING FILTER, CLARIFIER
B02	A01, TF-HIGH RATE, CLARIFIER
B03	A04, TRICKLING FILTER, CLARIFIER
B04	A01, TF-2 IN SERIES, CLARIFIER
B05	A01, TF-2 HIGH RATE IN SERIES, CLARIFIER
C	ACTIVATED SLUDGE
C01	A01, ACTIVATED SLUDGE, CLARIFIER
C02	EXTENDED AERATION, CLARIFIER-NO PRIMARY SETT-ING
C03	A04, ACTIVATED SLUDGE, CLARIFIER
C04	A01, AS-POLYMER ADDITION, CLARIFIER
C05	A01, AS-STEP AERATION, CLARIFIER
C06	A01, AS-HIGH RATE, CLARIFIER
C07	C01, POLISHING LAGOON
C08	EXTENDED AERATION, 2 POLISHING LAGOONS IN SERIES-NO PRIMARY SETTLING
C09	A01, AS-KRAUS PROCESS
C10	A01, AS-KRAUS PROCESS,2FACULTATIVE LAGOONS IN SERIES
C14	A01, AS-POLYMER ADDITION, POLISHING LAGOON
C19	ACTIVATED SLUDGE, CLARIFIER-NO PRIMARY SETTLING
C20	AS-HIGH RATE, CLARIFIER-NO PRIMARY SETTLING
D	FILTRATION
D01	C01, FILTRATION
D02	AS-CONVENTIONAL AND HIGH RATE IN PARALLEL, FILTRATION-NO PRIMARY SED
D03	C19, FILTRATION
D04	C20, FILTRATION
D05	EXTENDED AERATION, CLARIFIER, FILTRATION-NO PRIMARY SETTLING
D06	A01, AS-HIGH RATE, FILTRATION
D07	P02, FILTRATION
J	MISCELLANEOUS PROCESSES
J01	AERATED LAGOON
J02	OXIDATION DITCH, STABILIZATION POND

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                REPORT NO. 2                POTW CATEGORIZATION                5/15/75 DATE

CATEGORY                 DESCRIPTION                    NO. OF PLANTS          PERCENT OF TOTAL

  -01    UNDER 0.050           MGD TREATMENT FLOWRATE              6                      2
  -02    0.051 THRU    0.100 MGD                                   3                      1
  -03    0.101 THRU    0.250 MGD                                  11                      4
  -04    0.251 THRU    0.500 MGD                                  20                      7
  -05    0.501 THRU    1.000 MGD                                  29                     11
  -06    1.001 THRU    5.000 MGD                                 101                     38
  -07    5.001 THRU   12.500 MGD                                  39                     15
  -08   12.501 THRU   31.500 MGD                                  30                     11
  -09   31.501 THRU   75.000 MGD                                  12                      5
  -10   75.001 THRU  110.000 MGD                                   7                      2
  -11    OVER 110.000         MGD                                 11                      4
        TOTAL                                            [illegible]                    100

CATEGORY                 DESCRIPTION

     A   UNDER 30     PERCENT INDUSTRIAL FLOW
     B   31 THRU 40 PERCENT
     C   41 THRU 50 PERCENT
     D   51 THRU 60 PERCENT
     E   61 THRU 70 PERCENT
     F   OVER 70      PERCENT
     G   [illegible]
     H   [illegible]
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REPORT NO. 3

POTW REMOVAL DATA
REFERENCE INFORMATION

DATE 5/15/75 PAGE 1

REF.NO.	CATEGORY	SAMPLING PROCEDURE	SAMPLING DATE	REMARKS	MAJOR INDUSTRY	POTW CONTROL
1.00	B07.08G	FC024S	741030	EVERY 30 MIN	POULTRY	00
2.00	C09.08G	FC024S	741107	EVERY 30 MIN		
3.00	C10.06G	FC024S	741107	EVERY 30 MIN		
4.00	C05.06G	FC024S	741113	EVERY 30 MIN		
5.01	C02.04G	FC024S	741113	EVERY 30 MIN		
5.02	J01.04G	FC024S	741113	EVERY 30 MIN		
6.00	A01.08G	FC024S	741113	EVERY 30 MIN		
7.01	A01.10G	FC024S	741114	EVERY 30 MIN		
7.02	D01.06E	FC024S	741114	EVERY 30 MIN	TRUCK PLANT	
8.00	B01.04C	FC024S	730905	EVERY 30 MIN	METAL STAMP	
10.00	A01.06G	FC024S	741126	EVERY 30 MIN		
11.00	A01.06G	FC024S	741017	EVERY 30 MIN	TANNERY	
12.00	J02.03G	FC024S	730830	EVERY 30 MIN		
13.00	B01.03G	FC024S	730829	EVERY 30 MIN		
14.00	B02.04G	FC024S	710630	EVERY 30 MIN	CHEESE PLANT	00
15.00	A01-08G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		01
15.01	C05-10G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		
15.02	C05-11G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		01
15.03	C06-08G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		
15.04	C06-08G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		
15.05	C06-09G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		
15.06	C06-09G	G R	7201 THRU 7309	FC DLY,MO CUMP AVG		
15.07	C06-10G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		
15.08	C06-10G	G R	7201 THRU 7309	FC DLY,MO COMP AVG		
16.00	A02.08G	FC024S	741023	EVERY 30 MIN		
18.00	B02.05G	FC024S	741010	EVERY 30 MIN		
19.00	C01.06H	FC024S	741003	EVERY 30 MIN	TANNERY	
20.00	B02.06G	FC024S	741023	EVERY 30 MIN		
21.00	C06-04G	C 024S	700311 THRU 701203			
22.00	B02-01G	FC024S	710109 THRU 710119			
23.00	B01-06G	FC024S	710920			
24.00	B02-06G	FC024S	721114			
25.01	B02-06G	FC024S	710223 THRU 700826			
25.02	B02-06G	FC024S	710223 THRU 700826			
25.03	C06-07G	FC024S	710223 THRU 700215			
26.00	B02-03G	C 024S	710114			
28.00	B02-04G	FC024S	711102			
29.00	C06-04G	C 024S	710120			
30.00	B02-06G	C 024S	740305			
31.00	B02-04G	C 024S	710823 THRU 701112			
32.00	C01-11G	C 024S	740101 THRU 741231	INF 1X/WK,EFF DLY		
33.00	D01-04G	C 024S	740101 THRU 741231	INF 1X/WK,EFF DLY		
34.00	C01-11G	C 024S	740101 THRU 741231	INF 1X/WK,EFF DLY		
35.00	D01-06G	C 024S	740101 THRU 741231	INF 1X/WK,EFF DLY		
36.00	C01-11G	C 024S	740101 THRU 741231	INF 1X/WK,EFF DLY		
37.00	C02-05G	C 024S	740101 THRU 741231	INF 1X/WK,EFF DLY		
42.00	A01-06H	FC024S	740930	EVERY 4 HR	NONE	
43.00	B01-04A	FC000S	741112	EVERY 2 HR	COIN LAUNDRY	
44.00	B01-04A	C 024S	740723	EVERY 2 HR	MACHINE SHOP	
45.00	B04-05D	FC024S	740410	EVERY 2 HR		

REPORT NO. 3

POTW REMOVAL DATA
REFERENCE INFORMATION

DATE 5/15/75 PAGE 2

REF.NO.	CATEGORY	SAMPLING PROCEDURE	SAMPLING DATE	REMARKS	MAJOR INDUSTRY	POTW CONTROL
46.00	B04-06H	FC024S	741023	EVERY 3 HR	NONE	
47.00	C01-05A	G	740717		PLATING	
48.00	C01-05H	C 024S	740808		NONE	
49.00	C04-07A	G	741022		PLASTIC,MACH	
50.00	C06-06A	C 024S	740807			
51.00	C19-01H	C 024S	740723	EVERY 4 HR	NONE	
52.00	C19-03H	C 024S	740716		NONE	
53.00	C19-04G	FC024S	740522	FVERY HR		
54.00	C20-04A	C 024S	740813			
55.00	C20-06B	C 024S	741106	EVERY 3 HR	PLASTIC	
56.00	D01-04H	C 024S	740730	EVERY 2 HR	NONE	
57.00	D02-04A	C 024S	740710	EVERY 2 HR		
58.00	C01-01H	C 024S	740501		NONE	
58.01	J01-01H	C 024S	740501		NONE	
59.00	B03-05D	FC024S	740716	EVERY 2 HR		
59.01	03-04D	FC024S	740716	EVERY 2 HR		
60.00	C14-09A	FC024S	740709			
61.01	B02-08G	FC024R	6310 THRU 6311	HOURLY,13DAY AVG		
61.02	C01-05G	FC024R	6312	HOURLY,5DAY AVG		
61.03	C01-07G	FC024R	6307	HOURLY,14DAY AVG		
61.04	C01-09G	FC024R	6309	HOURLY,14DAY AVG		
65.01	A01-10G	FC S	730622 THRU 730802	DAILY, WK CUMP AVG		
65.02	C01-08G	FC S	730622 THRU 730802	DAILY, WK COMP AVG		
68.00	C01-08G	G	7301 THRU 7312	COMP WEEKLY,YR AVG		
69.00	B01-06G	FC024S	741030	EVERY 30 MIN		
71.00	H01-06G	FC024S	741106	EVERY 30 MIN		
72.00	H02-06G	FC024S	741009	EVERY 30 MIN		
73.00	C01-05G	FC024S	741106	EVERY 30MIN		
74.00	H02-06G	FC024S	741022	EVERY 30 MIN		
75.00	A01-07G	FC024S	741126			
76.00	A02-06G	FC024S	741022	EVERY 30 MIN		
77.00	B02-05G	FC024S	741121	EVERY 30 MIN		
78.00	H01-09G	G R	7307 THRU 7406	COMP MONTHLY,AVG		
78.01	H05-10G	G R	7307 THRU 7406	COMP MONTHLY,AVG		
81.01	A01-09G	FC S	7201 THRU 7207	DAILY,2WK COMP AVG		
81.02	A01-08F	FC S	7201 THRU 7207	DAILY,2WK COMP AVG		
81.03	A01-08G	FC S	7201 THRU 7207	DAILY,2WK COMP AVG		
81.04	A01-07G	FC S	7201 THRU 7207	DAILY,2WK COMP AVG		
81.05	C01-06G	FC S	7201 THRU 7207	DAILY,2WK COMP AVG		
81.06	A01-06G	FC S	7201 THRU 7207	DAILY,2WK CUMP AVG		
92.01	A01-07A	C 006S	6506	EVERY 15 MIN		
92.02	A01-07A	C 006S	6506	EVERY 15 MIN		
92.03	B01-07A	C 006S	6506	EVERY 15 MIN		
92.04	A01-06A	C 006S	6506	EVERY 15 MIN		
92.05	A01-06A	C 006S	6506	EVERY 15 MIN		
92.06	A01-064	C 006S	6506	EVERY 15 MIN		
92.08	A01-07A	C 006S	6506	EVERY 15 MIN		
92.09	A01-06A	C 006S	6506	EVERY 15 MIN		
92.10	A01-06A	C 006S	6506	EVERY 15 MIN		
92.11	A01-06A	C 006S	6506	EVERY 15 MIN		

POTW REMOVAL DATA
REFERENCE INFORMATION

REF NO.	CATEGORY	SAMPLING PROCEDURE	SAMPLING DATE	REMARKS	MAJOR INDUSTRY	POTW CONTROL
[redacted]	[redacted]	[redacted]	[redacted]	EVERY 15 MIN		
92.13	B01-06A	C 006S	6506	EVERY 15 MIN		
92.14	B01-07A	C 006S	6506	EVERY 15 MIN		
[redacted]	[redacted]	[redacted]	[redacted]	EVERY 15 MIN		
[redacted]	[redacted]	[redacted]	[redacted]	EVERY 15 MIN		
[redacted]	[redacted]	[redacted]	[redacted]	EVERY 15 MIN		
[redacted]	[redacted]	[redacted]	[redacted]	EVERY 15 MIN		
92.21	C01-06A	C 006S	6506	EVERY 15 MIN		
92.22	A01-06B	C 006S	6506	EVERY 15 MIN		
[redacted]	[redacted]	[redacted]	[redacted]	EVERY 15 MIN		
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
97.05	A01-06E	C 024S	7201 THRU 7205			
97.06	A01-07B	C 024S	7201 THRU 7205			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
97.11	C01-08B	C 024S	7201 THRU 7205			
97.12	C05-08B	C 024S	7201 THRU 7205			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
97.23	C01-08C	C 024S	7201 THRU 7205			
97.26	B01-07C	C 024S	7201 THRU 7205			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
97.31	B04-06A	C 024S	7201 THRU 7205			
97.32	B04-07C	C 024S	7201 THRU 7205			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]	[redacted]	[redacted]			
154.00	C07-06G	C 024S	740622 740623	AVG		
155.00	C01-02H	C 024S	740621 740622 740623	AVG	NONE	
[redacted]	[redacted]	[redacted]	[redacted]	AVG		
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]	[redacted]	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]			
163.00	C01.06G	C 024S	740827 THRU 740901	AVG 5 DAILY COMP	DYE	
164.00	B01.06A	C 024S	741028 THRU 741030	AVG 2 DAILY COMP	METAL PLAT	
[redacted]	[redacted]	[redacted]	[redacted]	AVG 2 DAILY COMP		
[redacted]	[redacted]	[redacted]	[redacted]		PLAT.DAIRY	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	PLAT.MEAT PKG	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		
202.00	A01-06F	C 006S	740516 740201	AVG		

POTW REMOVAL DATA
REFERENCE INFORMATION

REF.NO.	CATEGORY	SAMPLING PROCEDURE	SAMPLING DATE	REMARKS	MAJOR INDUSTRY	POTW CONTROL
203.00	B02-07H	C 006S	740626			
204.00	A01-07A	C 006S	740618			
205.00	A03-06A	C 006S	740816			
206.00	A01-05A	C 006S	740108 730828	AVG		
207.00	B01-06H	C 006S	740506 740318	AVG	NONE	
208.00	A01-06A	C 006S	740429 740208	AVG		
209.00	A01-05A	C 006S	740118 730731	AVG		
210.00	B01-07A	C 006S	740327 740115	AVG		
211.00	A01-06H	C 006S	740429 740307	AVG		
212.00	A01-09A	C 006S	740812			
213.00	A04-06D	C 006S	740531 740221	AVG		
214.00	B01-06H	C 006S	740207 730907	AVG	NONE	
215.00	A01-06H	C 006S	740701		NONE	
216.00	A01-06H	C 006S	740508 740308	AVG		
217.00	A01-08C	C 006S	740131 730925	AVG		
218.00	A01-09D	C 006S	730927			
219.00	B01-06H	C 006S	740621		NONE	
220.00	C01-09A	C 006S	740702			
221.00	B01-06A	C 006S	740626			
223.00	A01-08A	C 006S	740401 740114	AVG		
224.00	A01-06A	C 006S	740619			
225.00	A01-08A	C 006S	740621			
226.00	A01-05A	C 006S	740114			
227.00	AC1-06A	C 006S	740604			
229.00	A01-07A	C 006S	740221			
231.00	B02-06B	C 006S	740228 731220	AVG		
232.00	A01-09A	C 006S	740513 740226	AVG		
233.00	B02-06A	C 006S	740809			
234.00	A01-08A	C 006S	740618			
235.00	A01-08A	C 006S	740506 740315	AVG		
236.00	A01-06A	C 006S	740128 731119	AVG		
237.00	B02-06A	C 006S	740424 740227	AVG		
238.00	A01-06A	C 006S	740627			
239.00	C05-04A	C 006S	740125			
240.00	A01-05A	C 006S	740122 730906	AVG		
241.00	A01-05A	C 006S	740201 730223	AVG		
242.00	A01-01A	C 006S	740617			
243.00	A01-03A	C 006S	740424 740129	AVG		
245.00	A01-01A	C 006S	740618			
246.00	B02-06A	C 006S	740301 731220	AVG		
248.00	B01-05A	C 024	740205 740919	1974 AVG		
250.00	A01-03A	C 024	740328			
251.00	B01-06A	C 024	740124 0709 0808 0919	AND 741008 1212AVG		
252.00	A01-05A	C 024	740220 0820 1010 1212	1974 AVG		
253.00	C01-07A	C 024	740129 0418 0611 0702	0813 0904 1001 AVG		
254.00	B02-05B	C 024	740129 0620 0711 0801	0813 0910 1001 AVG		
255.00	B02-05A	C 024	740326 0815 1010 1210	1974 AVG		
256.00	C01-06B	C 024	740220 0606 0827 1022	1126 1974 AVG		
257.00	C01-06A	C 024	740827 1022 1126	1974 AVG		
258.00	B02-06A	C 024	741017			

POTW REMOVAL DATA
REFERENCE INFORMATION

REF. NO.	CATEGORY	SAMPLING PROCEDURE	SAMPLING DATE		REMARKS	MAJOR INDUSTRY	POTW CONTROL
259.00	A02-06C	C 024	740320	740811			
260.00	A01-06A	C 024	740507				
263.00	C01-07A	C 006S	740516	740327	AVG		
264.00	A01-08A	C 006S	740521	740322	AVG		
[illegible]	B01-07A	C 006S	740517				
267.00	C01-08A	C 006S	740501	740306	AVG		
268.00	C01-05A	C 006S	740530	740320	AVG		
269.00	C01-06A	C 006S	740514	740319	AVG		
270.00	C01-05A	C 006S	740305				
271.00	C01-06A	C 006S	740502	740307	AVG		
272.00	C01-08A	C 006S	[illegible]	740314	AVG		
274.00	A01-08A	C 006S	[illegible]	740311	AVG		
275.00	A01-07A	C 006S	740513	740318	AVG		
276.00	A01-08A	C 006S	740304				
277.00	C01-07B	C 006S	740326				
280.00	B01-04G	FC024S	720823		EVERY 15 MIN		
281.00	B01-04G	FC024R	740708		EVERY 6 MIN		
282.00	A01-05G	FC024S	671003		EVERY 15 MIN	DAIRY	
283.00	B01-05G	FC024S	691215		EVERY 15 MIN		
284.00	C01-06G	FC024S	740826		EVERY 10 MIN	MEAT PACKING	
285.00	C01-06G	C 024S	740430				
286.00	B03-06G	FC024S	700203		EVERY 15 MIN		
287.00	C01-06B	FC024S	740709		EVERY 6 MIN	BREWERY	
288.00	A01-04H	C 024S	740715		EVERY 15 MIN	NONE	
289.00	A01-06G	FC024S	730102	730103	15 MIN,2 DAY AVG		
291.00	C01-06A	FC024S	740724				
292.00	A01-06G	FC024S	690521		EVERY 15 MIN		
295.00	B01-06A	FC024S	750122		EVERY HR	POTATO CHIP	
296.00	C06-06A	FC024S	750213			PAINT, OIL	
297.00	B02-03A	FC024S	750107		EVERY HR	METAL,PLASTIC	
298.00	C06-06A	FC024S	750206			METAL	
299.00	C06-07G	FC024S	750204				
300.00	A01-03G	FC024S	750116			SLAUGHTER	
301.00	B01-03A	FC024S	750127		EVERY HR	DAIRY PROD	
302.00	B04-06H	FC024S	741023		EVERY 3HR	NONE	
303.01	C01-05G	FC024S	740911			METAL	
303.02	C02-05G	FC024S	740911			METAL	
304.00	C06-06H	FC024S	750115			NONE	
305.00	D06-06H	C 024S	750212		EVERY HR,INF GRAB	NONE	
306.00	B01-03G	FC024S	741203		EVERY HR	METAL	
307.00	B01-03G	FC024S	741217				
308.00	B03-02H	FC024S	750121			NONE	
309.00	C03-06F	FC024S	750121		INF BY POTW EQN	PAPER MILL	
310.00	B01-06G	FC024S	750219		EVERY 2HR	FOOD PROCESS	
311.00	A01-07G	FC024S	750128		EVERY HR	MFG,DAIRY	
312.00	B01-06G	FC024S	730813 THRU 730816		EVERY 1 HR	TEXTILE DYE	
313.01	B05-06A	FC024S	730618 THRU 730622			DAIRY-PLASTIC	
313.02	C02-06H	FC024S	730618 THRU 730620			NONE	
314.01	B02-07G	FC024S	730620 THRU 730624			ROOFING MFG.	
314.02	C01-06G	FC024S	730621 THRU 730623			PAPER-PAINT	

POTW REMOVAL DATA
REFERENCE INFORMATION

REF. NO.	CATEGORY	SAMPLING PROCEDURE	SAMPLING DATE	REMARKS	MAJOR INDUSTRY	POTW CONTROL
315.00	J01-05M	FC024S	730516 THRU 730620		NONE	
316.00	C01-07G	FC024S	740122 740423	AVG		
317.00	A01-05A	FC024S	740507		FOOD-PHARMA	01
318.00	B02-08G	FC024S	740116 THRU 741030	AVG 8 SAAMPLES	PAINT MFG	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	FOUNDRY	
[redacted]	[redacted]	[redacted]	[redacted]		PRINTING	01
[redacted]	[redacted]	[redacted]	[redacted]	AVG 4 SAMPLES	IRON-GLASS	
325.00	C06-11A	G S	740724 741010	AVG	MEAT PKG,PLAT	03
326.00	A02-11A	G S	740724 741010	AVG		03
326.01	A02-11A	G 024S	730924 THRU 731007	EVERY 4HR,14DAY AV		03
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		03
[redacted]	[redacted]	[redacted]	[redacted]	EVERY 4HR,8DAY AVG		03
[redacted]	[redacted]	[redacted]	[redacted]	AVG 7SAMPLES	MUNITION,DYE	03
329.00	B01-08B	G S	740822			04
331.00	D01-11A	G S	740122		STEEL,POWER	09
332.00	C01-09A	G S	730725 730726	AVG	PAPER MILL	04
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		03
[redacted]	[redacted]	[redacted]	[redacted]		WIRE	06
[redacted]	[redacted]	[redacted]	[redacted]			03

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 REPORT NO.4                                    POTW REMOVAL DATA ANALYSIS                                    PAGE  1
NOTE: (NEGATIVE REMOVALS DELETED)      24 HR COMPOSITE - 6 HR SIMULTANEOUS COMPOSITE, COMPARISON OF RESULTS                5/23/75

PARAMETERS                                    A1                          B1                          C1
                                       24     --     6            24     --     6            24     --     6

00550      OIL-GREASE       NO.      5.00          0.0           2.00          0.0           4.00          0.0
TOT-SXLT          MG/L      MAX     64.81          0.0          62.00          0.0          88.49          0.0
                            MIN     12.50          0.0          22.00          0.0           9.29          0.0
                            MEAN    39.63          0.0          42.00          0.0          66.57          0.0
                            STD.DEV 23.88          0.0          28.28          0.0          38.26          0.0

00556      OIL-GREASE       NO.      0.0           0.0           1.00          0.0           0.0           0.0
SEP-FUNNEL        MG/L      MAX      0.0           0.0          95.50          0.0           0.0           0.0
                            MIN      0.0           0.0          95.50          0.0           0.0           0.0
                            MEAN     0.0           0.0          95.50          0.0           0.0           0.0
                            STD.DEV  0.0           0.0           0.00          0.0           0.0           0.0

00560      OIL-GREASE       NO.      0.0           0.0           0.0           0.0           0.0           0.0
INFRARED          MG/L      MAX      0.0           0.0           0.0           0.0           0.0           0.0
                            MIN      0.0           0.0           0.0           0.0           0.0           0.0
                            MEAN     0.0           0.0           0.0           0.0           0.0           0.0
                            STD.DEV  0.0           0.0           0.0           0.0           0.0           0.0

00500      RESIDUE          NO.     11.00         10.00         12.00          5.00         16.00          3.00
TOTAL, TS         MG/L      MAX     40.96         44.82         31.40         63.33         63.91         51.64
                            MIN      1.37          5.15          0.62         14.03          7.44         12.30
                            MEAN    11.60         27.65         18.42         37.70         32.85         34.14
                            STD.DEV 11.78         13.11          7.96         19.19         16.12         20.03

00530      RESIDUE          NO.     15.00         27.00         23.00          6.00         29.00          9.00
TOT NFLT, SS      MG/L      MAX     67.78         91.89         96.55         96.58         98.54         97.37
                            MIN     21.45         16.79         25.86         19.72         33.33         40.32
                            MEAN    41.37         57.20         70.39         68.94         78.21         73.54
                            STD.DEV 15.41         17.75         19.43         37.34         20.19         21.23

00310      BOD              NO.     11.00         37.00         18.00          9.00         25.00         13.00
5DAY              MG/L      MAX     39.26         88.70         95.20         90.88         97.58         96.84
                            MIN      0.0           0.0          41.43          4.76         51.22         64.58
                            MEAN    17.60         34.87         76.74         69.10         84.27         86.49
                            STD.DEV 13.92         22.60         15.07         31.38         13.18          9.80

00340      COD              NO.     10.00          0.0          15.00          0.0          19.00          0.0
HI LEVEL          MG/L      MAX     81.77          0.0          93.32          0.0          92.86          0.0
                            MIN      4.68          0.0          34.38          0.0          23.70          0.0
                            MEAN    27.15          0.0          68.64          0.0          71.95          0.0
                            STD.DEV 22.12          0.0          17.03          0.0          17.41          0.0

00335      COD              NO.      1.00          0.0           0.0           0.0           1.00          0.0
LOW LEVEL         MG/L      MAX     19.39          0.0           0.0           0.0          91.72          0.0
                            MIN     19.39          0.0           0.0           0.0          91.72          0.0
                            MEAN    19.39          0.0           0.0           0.0          91.72          0.0
                            STD.DEV  0.00          0.0           0.0           0.0           0.00          0.0

00342      SEA COD          NO.      2.00          0.0           3.00          0.0           5.00          0.0
SALINE            MG/L      MAX     19.39          0.0          78.48          0.0          93.35          0.0
                            MIN      0.0           0.0          61.65          0.0          52.34          0.0
                            MEAN     9.70          0.0          71.15          0.0          75.03          0.0
                            STD.DEV 13.71          0.0           8.62          0.0          16.10          0.0
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REPORT NO.4                                          POTW REMOVAL DATA ANALYSIS                                       PAGE  2
NOTE: (NEGATIVE REMOVALS DELETED)      24 HR COMPOSITE - 6 HR SIMULTANEOUS COMPOSITE, COMPARISON OF RESULTS                    5/23/75

                                                A1                            B1                           C1
PARAMETERS                              24      --      6             24      --      6             24     --      6

32730      PHENOLICS          NO.      1.00           0.0             6.00          0.0            8.00           0.0
4AAP DISTIL       UG/L        MAX     50.00           0.0            79.41          0.0           98.26           0.0
                              MIN     50.00           0.0             0.0           0.0            0.0            0.0
                              MEAN    50.00           0.0            50.57          0.0           52.90           0.0
                           STD.DEV     0.00           0.0            30.26          0.0           37.05           0.0

00945      SULFATE            NO.      4.00           9.00            4.00          4.00           5.00           2.00
                  MG/L        MAX     57.89          27.78           79.74         43.75          25.42          38.57
                              MIN      0.0            0.0             2.80         17.14           5.71           0.0
                              MEAN    16.08           7.12           34.29         28.66          18.40          19.29
                           STD.DEV    27.98          10.93           32.44         12.40           7.51          27.27

00665      TOTAL              NO.      5.00           0.0            11.00          0.0           20.00           0.0
PHOSPHORUS        MG/L        MAX     16.25           0.0            52.54          0.0           92.31           0.0
                              MIN      0.0            0.0             9.14          0.0            9.72           0.0
                              MEAN     9.65           0.0            26.12          0.0           49.96           0.0
                           STD.DEV     6.42           0.0            14.25          0.0           26.34           0.0

00610      NITROGEN,          NO.     10.00          28.00           15.00          5.00          21.00          10.00
AMMONIA           MG/L        MAX     61.05          64.29           99.49         37.50          98.00          84.21
                              MIN      0.0            0.0             2.78          5.26           3.79           6.69
                              MEAN    19.08          20.91           47.81         17.08          45.49          36.23
                           STD.DEV    21.08          14.97           29.37         13.71          33.68          23.75

00625      NITROGEN,          NO.      6.00           0.0            10.00          1.00          10.00           0.0
KJELDAHL, TOTAL MG/L          MAX     59.72           0.0            85.31         93.68          91.67           0.0
                              MIN      0.0            0.0             7.00         93.68          10.71           0.0
                              MEAN    21.32           0.0            40.36         93.68          37.00           0.0
                           STD.DEV    21.88           0.0            26.48          0.00          25.89           0.0

01002 TOT ARSENIC             NO.      1.00           0.0             1.00          0.0            1.00           0.0
AS                UG/L        MAX      0.0            0.0             0.0           0.0           60.00           0.0
                              MIN      0.0            0.0             0.0           0.0           60.00           0.0
                              MEAN     0.0            0.0             0.0           0.0           60.00           0.0
                           STD.DEV     0.00           0.0             0.00          0.0            0.00           0.0

01027 TOT CADMIUM             NO.     13.00           9.00           13.00          2.00          15.00           1.00
CD                UG/L        MAX     25.00           0.0            75.00          0.0           80.00           0.0
                              MIN      0.0            0.0             0.0           0.0            0.0            0.0
                              MEAN     5.77           0.0            24.24          0.0           18.36           0.0
                           STD.DEV    10.96        *******           28.80       *******          29.97           0.00

01034 TOT CHROMIUM            NO.     14.00          11.00           17.00          6.00          21.00           1.00
CR                UG/L        MAX     80.00          66.67           98.94         50.00          98.33           0.0
                              MIN      0.0            0.0             0.0           0.0            0.0            0.0
                              MEAN    31.49          18.11           47.83         20.00          61.41           0.0
                           STD.DEV    32.10          22.99           32.42         24.49          33.02           0.00

01051 TOT LEAD                NO.     15.00           8.00           15.00          3.00          24.00           1.00
PB                UG/L        MAX     88.24          50.00           92.97         90.00          95.00           0.0
                              MIN      0.0            0.0             0.0           0.0            0.0            0.0
                              MEAN    16.66          18.75           36.22         30.00          46.80           0.0
                           STD.DEV    29.12          20.77           29.96         51.96          32.43           0.00
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NOTE: (NEGATIVE REMOVALS DELETED) 24 HR COMPOSITE - 6 HR SIMULTANEOUS COMPOSITE, COMPARISON OF RESULTS 5/23/75

PARAMETERS			A1		B1		C1	
			24	6	24	6	24	6
71900 TOT MERCURY		NO.	8.00	7.00	6.00	2.00	17.00	1.00
HG	UG/L	MAX	75.00	75.00	61.54	66.67	99.58	81.25
		MIN	0.0	0.0	0.0	50.00	0.0	81.25
		MEAN	31.70	26.43	30.93	58.33	50.74	81.25
		STD.DEV	34.10	30.51	26.19	11.79	30.20	0.00
01042 TOT COPPER		NO.	15.00	18.00	19.00	7.00	25.00	5.00
CU	UG/L	MAX	77.27	46.88	95.23	85.00	92.31	64.29
		MIN	0.0	0.0	16.67	0.0	14.29	25.00
		MEAN	32.54	13.17	54.49	49.57	63.10	46.52
		STD.DEV	27.12	15.84	23.79	33.46	22.54	16.93
01097 TOT ANTIMONY		NO.	0.0	0.0	0.0	0.0	0.0	0.0
	UG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.0	0.0	0.0
		STD.DEV	0.0	0.0	0.0	0.0	0.0	0.0
01067 TOT NICKEL		NO.	14.00	8.00	11.00	2.00	22.00	1.00
NI	UG/L	MAX	92.19	0.0	86.39	0.0	80.00	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	9.84	0.0	19.95	0.0	21.67	0.0
		STD.DEV	25.43	*******	25.61	*******	24.39	0.00
01147 TOT SELENIUM		NO.	0.0	0.0	0.0	0.0	1.00	0.0
	UG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.0	0.0	0.0
		STD.DEV	0.0	0.0	0.0	0.0	0.00	0.0
01077 TOT SILVER		NO.	0.0	0.0	0.0	0.0	0.0	0.0
AG	UG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.0	0.0	0.0
		STD.DEV	0.0	0.0	0.0	0.0	0.0	0.0
01092 TOT ZINC		NO.	12.00	14.00	19.00	5.00	27.00	2.00
ZN	UG/L	MAX	66.67	68.75	87.88	70.42	99.29	66.67
		MIN	0.0	0.0	0.0	20.00	0.0	52.94
		MEAN	37.33	19.70	47.74	42.05	62.87	59.80
		STD.DEV	21.99	19.27	24.34	18.54	27.13	9.71
01102 TOT TIN		NO.	0.0	0.0	0.0	0.0	1.00	0.0
	UG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.0	0.0	0.0
		STD.DEV	0.0	0.0	0.0	0.0	0.00	0.0
00680 TOT ORG CARBON		NO.	6.00	22.00	3.00	5.00	4.00	4.00
TOTAL,TOC	MG/L	MAX	50.94	56.43	76.76	84.13	87.78	74.07
		MIN	6.82	0.0	60.59	56.32	70.90	41.94
		MEAN	24.06	24.69	70.51	72.35	78.07	64.12
		STD.DEV	10.20	18.80	8.69	11.44	7.04	15.10

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 REPORT NO.4                                         POTW REMOVAL DATA ANALYSIS
NOTE: (NEGATIVE REMOVALS DELETED)       24 HR COMPOSITE - 6 HR SIMULTANEOUS COMPOSITE, COMPARISON OF RESULTS        PAGE  4
                                                                                                                            5/23/75
 PARAMETERS
                                        A1                       B1                          C1
                                  24    --     6           24    --     6              24    --     6

 01105 TOT ALUMINUM       NO.     1.00        0.0          2.00        0.0              2.00        0.0
 AL             UG/L      MAX    10.87        0.0         41.67        0.0             31.03        0.0
                          MIN    10.87        0.0          0.0         0.0              0.0         0.0
                          MEAN   10.87        0.0         20.83        0.0             15.52        0.0
                      STD.DEV     0.00        0.0         29.46        0.0             21.94        0.0

 01045 TOT IRON           NO.    10.00       11.00         9.00        3.00            15.00        3.00
 FE             UG/L      MAX    88.85       75.00        79.85       87.50            47.67       97.50
                          MIN    13.79        0.0          0.0        46.67             7.70       42.06
                          MEAN   37.33       43.25        42.45       63.39            59.73       77.79
                      STD.DEV    24.97       19.45        22.17       21.40            29.85       30.34

 01055 TOT MANGANESE      NO.     6.00        7.00         5.00        3.00             4.00        0.0
 MN             UG/L      MAX    33.33       81.25        64.54        0.0             42.86        0.0
                          MIN     2.90        0.0         18.52        0.0              3.33        0.0
                          MEAN   12.19       14.94        48.36        0.0             18.83        0.0
                      STD.DEV    10.87       29.89        18.04     *******            17.63        0.0

 00720      CYANIDE,      NO.     1.00        0.0          2.00        0.0              4.00        0.0
 TOTAL          MG/L      MAX     0.0         0.0          0.0         0.0             98.21        0.0
                          MIN     0.0         0.0          0.0         0.0              0.0         0.0
                          MEAN    0.0         0.0          0.0         0.0             54.86        0.0
                      STD.DEV     0.00        0.0       *******        0.0             44.78        0.0

 38260      MBAS          NO.     2.00        0.0          5.00        0.0              6.00        0.0
                MG/L      MAX    90.86        0.0         78.24        0.0             93.52        0.0
                          MIN    10.67        0.0         35.43        0.0             33.76        0.0
                          MEAN   50.76        0.0         60.46        0.0             63.70        0.0
                      STD.DEV    56.71        0.0         22.05        0.0             24.52        0.0

 01032      HEXAVALENT    NO.     3.00        0.0          5.00        0.0              4.00        0.0
 CHROMIUM, UG/L AS CR     MAX     0.0         0.0         60.00        0.0             54.29        0.0
                          MIN     0.0         0.0          0.0         0.0              0.0         0.0
                          MEAN    0.0         0.0         24.45        0.0             13.57        0.0
                      STD.DEV *******         0.0         30.02        0.0             27.14        0.0

 00605      NITROGEN,     NO.     3.00        7.00         4.00        2.00             9.00        4.00
 ORGANIC        MG/L      MAX    63.64       69.23        66.67       75.00            94.60       85.71
                          MIN     1.17        9.09         0.0        66.67            14.49       76.92
                          MEAN   30.49       43.66        35.40       70.83            61.30       81.81
                      STD.DEV    31.41       21.00        27.47        5.89            27.71        4.09

 00666      DISSOLVED     NO.     1.00        0.0          1.00        0.0              2.00        0.0
 PHOSPHORUS     MG/L      MAX     0.0         0.0         14.81        0.0             49.15        0.0
                          MIN     0.0         0.0         14.81        0.0             43.42        0.0
                          MEAN    0.0         0.0         14.81        0.0             46.29        0.0
                      STD.DEV     0.00        0.0          0.00        0.0              4.05        0.0

 01040      COPPER,       NO.     0.0        23.00         0.0         6.00             0.0         7.00
 DISSOLVED MG/L AS CU     MAX     0.0        65.00         0.0        62.50             0.0        87.50
                          MIN     0.0         0.0          0.0         0.0              0.0        12.50
                          MEAN    0.0        18.74         0.0        37.24             0.0        56.09
                      STD.DEV     0.0        17.07         0.0        23.09             0.0        28.97
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REPORT NO.4                                          POTW REMOVAL DATA ANALYSIS                                   PAGE  5
NOTE: (NEGATIVE REMOVALS DELETED)     24 HR COMPOSITE - 6 HR SIMULTANEOUS COMPOSITE, COMPARISON OF RESULTS                 5/23/75
PARAMETERS
                                             A1                            B1                            C1
                                      24     --     6             24       --     6             24       --     6

01030      CHROMIUM,         NO.      0.0         28.00           0.0           6.00            0.0            9.00
DISSOLVFD  MG/L AS CR        MAX      0.0         80.65           0.0          50.00            0.0           65.67
                             MIN      0.0          0.0            0.0           0.0             0.0            0.0
                             MEAN     0.0         15.59           0.0           8.33            0.0           22.61
                          STD.DEV     0.0         22.92           0.0          20.41            0.0           28.92

01049      LEAD,             NO.      0.0         31.00           0.0           6.00            0.0            9.00
DISSOLVED  MG/L AS PB        MAX      0.0         66.67           0.0          90.00            0.0            0.0
                             MIN      0.0          0.0            0.0           0.0             0.0            0.0
                             MEAN     0.0         10.22           0.0          33.06            0.0            0.0
                          STD.DEV     0.0         21.81           0.0          40.69            0.0          *******

01065      NICKEL,           NO.      0.0         29.00           0.0           6.00            0.0            9.00
DISSOLVED  MG/L AS NI        MAX      0.0         50.00           0.0           0.0             0.0           55.56
                             MIN      0.0          0.0            0.0           0.0             0.0            0.0
                             MEAN     0.0          4.09           0.0           0.0             0.0           12.23
                          STD.DEV     0.0         12.58           0.0         *******           0.0           24.28

01025      CADMIUM,          NO.      0.0         31.00           0.0           6.00            0.0            9.00
DISSOLVFD  MG/L AS CD        MAX      0.0         25.00           0.0           0.0             0.0           57.14
                             MIN      0.0          0.0            0.0           0.0             0.0            0.0
                             MEAN     0.0          0.81           0.0           0.0             0.0           11.90
                          STD.DEV     0.0          4.49           0.0         *******           0.0           23.69

01056      MANGANESE,        NO.      0.0         18.00           0.0           5.00            0.0            5.00
DISSOLVFD  MG/L AS MN        MAX      0.0         21.43           0.0          35.71            0.0           92.86
                             MIN      0.0          0.0            0.0           0.0             0.0            0.0
                             MEAN     0.0          5.65           0.0          12.14            0.0           34.57
                          STD.DEV     0.0          7.14           0.0          17.05            0.0           37.57

71890      MERCURY,          NO.      0.0         20.00           0.0           2.00            0.0            7.00
DISSOLVFD  MG/L AS HG        MAX      0.0         84.21           0.0          50.00            0.0           14.29
                             MIN      0.0          0.0            0.0          22.22            0.0            0.0
                             MEAN     0.0         21.28           0.0          36.11            0.0            2.04
                          STD.DEV     0.0         26.16           0.0          19.64            0.0            5.40

70507      TOT ORTHO-        NO.      1.00        21.00           0.0           4.00            0.0            8.00
PHOSPHATE        MG/L        MAX      6.10        82.93           0.0          25.42            0.0           63.64
                             MIN      6.10         0.0            0.0           9.09            0.0            2.33
                             MEAN     6.10        28.12           0.0          16.15            0.0           38.43
                          STD.DEV     0.00        20.66           0.0           6.82            0.0           22.45

00690      TOT CARBON        NO.      0.0         26.00           0.0           5.00            0.0            4.00
           MG/L AS C         MAX      0.0         57.01           0.0          83.80            0.0           61.33
                             MIN      0.0          0.0            0.0          52.09            0.0           34.02
                             MEAN     0.0         22.29           0.0          68.35            0.0           52.29
                          STD.DEV     0.0         18.05           0.0          12.71            0.0           12.76
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REPORT NO.4                                                  POTW REMOVAL DATA ANALYSIS                                              PAGE  6
NOTE: (NEGATIVE REMOVALS DELETED)        24 HR COMPOSITE - 6 HR SIMULTANEOUS COMPOSITE. COMPARISON OF RESULTS                          5/23/75
PARAMETERS
                                               A1                              B1                             C1
                                        24     --     6                24      --      6               24     --      6

00650      TOTAL               NO.     3.00          9.00             2.00           3.00             4.00           3.00
PHOSPHATE          MG/L        MAX    46.55         34.88            11.75          53.57            24.10          63.16
                               MIN     1.56          7.69             1.35          41.18            16.98          39.39
                               MEAN   18.67         22.47             6.55          45.56            20.83          48.16
                             STD.DEV  24.35          9.42             7.35           6.95             3.49          13.05

00671      DISSOLVED           NO.     2.00          0.0              3.00           0.0              2.00           0.0
ORTHOPHOSPHATE     MG/L        MAX    20.00          0.0             50.59           0.0             96.80           0.0
                               MIN     7.89          0.0              2.17           0.0             84.21           0.0
                               MEAN   13.95          0.0             24.13           0.0             90.51           0.0
                             STD.DEV   8.56          0.0             24.52           0.0              8.90           0.0

01037      COBALT,TOT          NO.     0.0           0.0              0.0            0.0              0.0            0.0
           UG/L AS CO          MAX     0.0           0.0              0.0            0.0              0.0            0.0
                               MIN     0.0           0.0              0.0            0.0              0.0            0.0
                               MEAN    0.0           0.0              0.0            0.0              0.0            0.0
                             STD.DEV   0.0           0.0              0.0            0.0              0.0            0.0

01007      BARIUM,TOT          NO.     1.00          0.0              0.0            0.0              0.0            0.0
           UG/L AS BA          MAX     0.0           0.0              0.0            0.0              0.0            0.0
                               MIN     0.0           0.0              0.0            0.0              0.0            0.0
                               MEAN    0.0           0.0              0.0            0.0              0.0            0.0
                             STD.DEV   0.00          0.0              0.0            0.0              0.0            0.0
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REPORT NO.5
NOTE: NEGATIVE REMOVALS DELETED                                  POTW REMOVAL DATA ANALYSIS BY PLANT                PAGE  1          5/23/75

IPARAMETERS
V                          CATEGORY
                           -------->     A1       OTHER A      B1      OTHER B      C1      OTHER C    MISC(D,J)
00550      OIL-GREASE      NO.POTW      5.00       1.00       2.00       3.00      4.00       2.00       0.0
TOT-SXLT         MG/L        MAX       64.81      90.14      62.00      73.84     88.49      92.86       0.0
                             MIN       12.50      90.14      22.00      36.59      9.29      51.69       0.0
                             MEAN      39.63      90.14      42.00      58.48     66.57      72.27       0.0
                           STD.DEV     23.88       0.00      28.28      19.47     38.26      29.11       0.0
00556      OIL-GREASE      NO.POTW      0.0        0.0        1.00       0.0       0.0        3.00       1.00
SEP-FUNNEL       MG/L        MAX        0.0        0.0       95.50       0.0       0.0       90.00      88.89
                             MIN        0.0        0.0       95.50       0.0       0.0       84.00      88.89
                             MEAN       0.0        0.0       95.50       0.0       0.0       87.17      88.89
                           STD.DEV      0.0        0.0        0.00       0.0       0.0        3.01       0.00
00560      OIL-GREASE      NO.POTW      0.0        0.0        0.0        0.0       0.0        0.0        0.0
INFRARED         MG/L        MAX        0.0        0.0        0.0        0.0       0.0        0.0        0.0
                             MIN        0.0        0.0        0.0        0.0       0.0        0.0        0.0
                             MEAN       0.0        0.0        0.0        0.0       0.0        0.0        0.0
                           STD.DEV      0.0        0.0        0.0        0.0       0.0        0.0        0.0
00500      RESIDUE         NO.POTW     21.00       5.00      17.00      24.00     20.00      12.00       2.00
TOTAL, TS        MG/L        MAX       44.82      24.08      63.33      61.35     63.91      31.72      46.02
                             MIN        1.37       0.0        0.62       7.79      7.44       5.11      21.78
                             MEAN      19.25       8.70      24.09      28.97     32.46      16.84      33.90
                           STD.DEV     14.63      10.03      14.75      14.23     15.96       9.32      17.14
00530      RESIDUE         NO.POTW     42.00       8.00      32.00      37.00     41.00      29.00       9.00
TOT NFLT, SS     MG/L        MAX       91.89      62.88      96.58      97.42     98.54      98.54      97.94
                             MIN       16.79      25.81      19.72      30.61     33.33       8.57      59.66
                             MEAN      51.55      49.14      71.94      76.10     77.35      75.15      87.98
                           STD.DEV     18.43      11.64      23.10      15.45     19.58      23.21      12.68
00310      BOD             NO.POTW     48.00       6.00      30.00      33.00     41.00      30.00       9.00
5DAY             MG/L        MAX       88.70      42.44      95.20      97.22     97.58      99.22      98.46
                             MIN        0.0        1.79       4.76      43.75     51.22      17.86      71.77
                             MEAN      30.91      24.27      75.76      78.86     85.20      83.38      91.15
                           STD.DEV     22.05      15.65      21.00      15.09     11.73      18.47       9.22
00340      COD             NO.POTW     10.00       6.00      15.00      14.00     20.00      13.00       5.00
HI LEVEL         MG/L        MAX       81.77      78.29      93.32      87.20     92.86      93.52      86.88
                             MIN        4.64      13.26      34.38      37.33     23.70      74.83      63.70
                             MEAN      27.15      33.62      68.64      68.15     71.28      84.77      72.43
                           STD.DEV     22.12      23.82      17.03      14.49     17.21       6.08       9.29
00335      COD             NO.POTW      1.00       0.0        0.0        0.0       1.00       2.00       1.00
LOW LEVEL        MG/L        MAX       19.39       0.0        0.0        0.0      91.72      94.81      89.63
                             MIN       19.39       0.0        0.0        0.0      91.72      72.13      89.63
                             MEAN      19.39       0.0        0.0        0.0      91.72      83.47      89.63
                           STD.DEV      0.00       0.0        0.0        0.0       0.00      16.04       0.00
00342      SEA COD         NO.POTW      2.00       0.0        3.00       6.00      6.00       4.00       2.00
SALINE           MG/L        MAX       19.39       0.0       78.48      95.40     93.35      83.89      91.93
                             MIN        0.0        0.0       61.65      48.20     52.34      64.58      89.33
                             MEAN       9.70       0.0       71.15      79.75     77.62      74.21      90.63
                           STD.DEV     13.71       0.0        8.62      17.69     15.74       8.02       1.84
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REPORT NO.5
NOTE: NEGATIVE REMOVALS DELETED

POTW REMOVAL DATA ANALYSIS BY PLANT

IPARAMETERS V	CATEGORY ------>	A1	OTHER A	B1	OTHER B	C1	OTHER C	MISC(D,J)
32730 PHENOLICS	NO.POTW	1.00	1.00	7.00	5.00	8.00	10.00	4.00
4AAP DISTIL UG/L	MAX	50.00	25.00	79.41	85.00	98.26	96.05	89.47
	MIN	50.00	25.00	0.0	7.74	0.0	69.23	0.0
	MEAN	50.00	25.00	52.14	48.18	52.90	84.68	64.69
	STD.DEV	0.00	0.00	27.94	31.35	37.05	9.57	43.22
00945 SULFATE	NO.POTW	13.00	0.0	8.00	3.00	8.00	7.00	1.00
MG/L	MAX	57.89	0.0	79.74	18.18	38.57	64.58	60.69
	MIN	0.0	0.0	2.80	6.38	0.0	0.0	60.69
	MEAN	9.88	0.0	31.48	12.69	17.28	11.52	60.69
	STD.DEV	17.14	0.0	22.93	5.94	12.40	23.63	0.00
00665 TOTAL	NO.POTW	5.00	3.00	14.00	12.00	22.00	19.00	5.00
PHOSPHORUS MG/L	MAX	16.25	52.38	53.57	99.42	92.31	90.60	69.74
	MIN	0.0	20.00	9.14	0.0	9.72	0.0	20.91
	MEAN	9.65	32.23	27.90	30.03	50.44	40.79	42.34
	STD.DEV	6.42	17.59	14.53	32.64	25.20	27.87	20.16
00610 NITROGEN,	NO.POTW	38.00	7.00	23.00	26.00	32.00	22.00	7.00
AMMONIA MG/L	MAX	64.29	26.87	99.49	98.98	98.00	99.70	97.00
	MIN	0.0	1.15	2.78	0.0	3.79	9.76	0.0
	MEAN	20.43	15.37	38.86	45.26	42.58	60.50	70.19
	STD.DEV	16.50	8.65	27.52	33.49	30.24	31.57	37.25
00625 NITROGEN,	NO.POTW	6.00	1.00	12.00	9.00	10.00	8.00	0.0
KJELDAHL, TOTAL MG/L	MAX	59.72	24.39	93.68	88.72	91.67	93.60	0.0
	MIN	0.0	24.39	7.00	16.86	10.71	4.55	0.0
	MEAN	21.32	24.39	46.33	59.02	37.00	53.62	0.0
	STD.DEV	21.88	0.00	28.70	26.89	25.89	33.40	0.0
01002 TOT ARSENIC	NO.POTW	1.00	0.0	1.00	3.00	1.00	6.00	0.0
AS UG/L	MAX	0.0	0.0	0.0	33.33	60.00	60.00	0.0
	MIN	0.0	0.0	0.0	0.0	60.00	0.0	0.0
	MEAN	0.0	0.0	0.0	22.22	60.00	19.72	0.0
	STD.DEV	0.00	0.0	0.00	19.24	0.00	30.56	0.0
01027 TOT CADMIUM	NO.POTW	28.00	3.00	18.00	18.00	19.00	29.00	5.00
CD UG/L	MAX	45.45	76.47	75.00	66.67	80.00	87.69	50.00
	MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	6.37	25.49	24.65	13.96	15.08	15.56	16.00
	STD.DEV	12.17	44.15	27.08	21.86	27.32	25.88	23.02
01034 TOT CHROMIUM	NO.POTW	31.00	6.00	27.00	22.00	27.00	33.00	6.00
CR UG/L	MAX	80.00	69.15	98.94	85.71	98.33	92.31	77.01
	MIN	0.0	7.89	0.0	0.0	0.0	0.0	0.0
	MEAN	25.43	33.47	41.92	33.83	60.15	37.43	37.72
	STD.DEV	26.36	26.12	31.68	28.44	32.23	32.13	36.95
01051 TOT LEAD	NO.POTW	28.00	8.00	21.00	21.00	29.00	28.00	8.00
PB UG/L	MAX	88.24	77.88	93.42	84.62	95.00	90.65	93.33
	MIN	0.0	0.0	0.0	0.0	0.0	0.0	6.25
	MEAN	20.10	32.08	40.26	31.98	42.96	36.31	43.35
	STD.DEV	25.04	29.53	33.29	29.68	32.83	31.99	32.46

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REPORT NO.5                                                       POTW REMOVAL DATA ANALYSIS BY PLANT        PAGE   3          5/23/75
NOTE: NEGATIVE REMOVALS DELETED

IPARAMETERS          CATEGORY     A1        OTHER A         B1        OTHER B        C1       OTHER C        MISC(D,J)
V                    ------->
71900 TOT MERCURY    NO.POTW     19.00         3.00        9.00        12.00       19.00       19.00         4.00
MG              UG/L   MAX       75.00         0.0        66.67        50.00       99.58       71.43        50.00
                       MIN        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MEAN      29.79         0.0        38.77        25.60       50.55       25.02        20.83
                     STD.DEV     28.65      *******       24.41        21.60       30.44       27.33        25.00

01042 TOT COPPER     NO.POTW     39.00         5.00       30.00        20.00       35.00       35.00         7.00
CU              UG/L   MAX       77.27        73.33       95.23        85.00       95.16       92.86        95.83
                       MIN        0.0         12.90        0.0         20.00       14.29        0.0         50.97
                       MEAN      23.89        38.71       56.02        51.53       61.23       56.39        77.81
                     STD.DEV     23.78        24.16       26.07        20.90       22.64       25.53        15.05

01097 TOT ANTIMONY   NO.PUTW      0.0          0.0         0.0          0.0         0.0         1.00         0.0
                UG/L   MAX        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MIN        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MEAN       0.0          0.0         0.0          0.0         0.0         0.0          0.0
                     STD.DEV      0.0          0.0         0.0          0.0         0.0         0.00         0.0

01067 TOT NICKEL     NO.POTW     24.00         4.00       16.00        19.00       26.00       28.00         5.00
NI              UG/L   MAX       92.19        14.29       86.39        96.67       80.00       76.35        44.83
                       MIN        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MEAN       6.34         6.07       22.34        27.01       22.06       24.56        23.85
                     STD.DEV     19.78         7.23       27.02        30.37       23.41       23.90        22.58

01147 TOT SELENIUM   NO.POTW      0.0          0.0         0.0          1.00        1.00        3.00         0.0
                UG/L   MAX        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MIN        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MEAN       0.0          0.0         0.0          0.0         0.0         0.0          0.0
                     STD.DEV      0.0          0.0         0.0          0.00        0.00      *******        0.0

01077 TOT SILVER     NO.POTW      0.0          0.0         0.0          2.00        0.0         1.00         0.0
AG              UG/L   MAX        0.0          0.0         0.0         33.33        0.0         0.0          0.0
                       MIN        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MEAN       0.0          0.0         0.0         16.67        0.0         0.0          0.0
                     STD.DEV      0.0          0.0         0.0         23.57        0.0         0.00         0.0

01092 TOT ZINC       NO.POTW     32.00         7.00       28.00        27.00       34.00       32.00         5.00
ZN              UG/L   MAX       68.75        88.00       88.57        92.50       99.29       91.67        91.67
                       MIN        0.0          5.41        0.0          0.0         0.0         0.0         37.41
                       MEAN      29.87        32.80       47.70        48.88       63.93       52.60        74.72
                     STD.DEV     21.73        30.30       22.86        23.82       25.38       24.29        21.55

01102 TOT TIN        NO.POTW      0.0          0.0         0.0          1.00        1.00        3.00         0.0
                UG/L   MAX        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MIN        0.0          0.0         0.0          0.0         0.0         0.0          0.0
                       MEAN       0.0          0.0         0.0          0.0         0.0         0.0          0.0
                     STD.DEV      0.0          0.0         0.0          0.00        0.00      *******        0.0

00680 TOT ORG CARBON NO.POTW     28.00         3.00        8.00        16.00        8.00        8.00         2.00
TOTAL,TOC       MG/L   MAX       56.43        26.45       84.13        82.84       87.78       89.36        75.12
                       MIN        0.0          4.48       56.32         8.08       41.94       60.23        57.50
                       MEAN      24.56        17.75       71.66        60.38       71.10       78.70        66.31
                     STD.DEV     18.05        11.68        9.87        19.69       13.21       10.17        12.46
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REPORT NO.5
NOTE: NEGATIVE REMOVALS DELETED

POTW REMOVAL DATA ANALYSIS BY PLANT

5/23/75

IPARAMETERS V	CATEGORY ------->>	A1	OTHER A	B1	OTHER B	C1	OTHER C	MISC(D,J)
01105 TOT ALUMINUM	NO.POTW	1.00	0.0	3.00	2.00	3.00	7.00	3.00
AL UG/L	MAX	10.87	0.0	91.09	89.58	31.03	94.22	97.87
	MIN	10.87	0.0	0.0	75.00	0.0	0.0	0.0
	MEAN	10.87	0.0	44.25	82.29	15.90	46.57	55.54
	STD.DEV	0.00	0.0	45.60	10.31	15.53	32.71	50.26
01045 TOT IRON	NO.POTW	21.00	7.00	14.00	16.00	20.00	19.00	8.00
FE UG/L	MAX	88.89	73.64	87.50	89.83	97.67	97.73	97.67
	MIN	0.0	0.0	0.0	0.0	7.70	10.00	17.91
	MEAN	40.43	35.82	48.80	50.44	63.92	65.82	81.41
	STD.DEV	21.89	22.42	24.39	27.70	28.48	24.86	27.37
01055 TOT MANGANESE	NO.POTW	13.00	3.00	9.00	13.00	6.00	14.00	6.00
MN UG/L	MAX	81.25	29.73	64.54	71.95	42.86	93.46	90.91
	MIN	0.0	7.38	0.0	6.63	3.33	0.0	22.47
	MEAN	13.67	18.82	30.57	30.74	25.45	44.88	54.12
	STD.DEV	22.32	11.19	26.70	20.87	17.18	34.30	26.13
00720 CYANIDE,	NO.POTW	1.00	1.00	3.00	1.00	3.00	6.00	4.00
TOTAL MG/L	MAX	0.0	66.67	80.00	6.54	98.21	86.57	93.90
	MIN	0.0	66.67	0.0	6.54	0.0	0.0	0.0
	MEAN	0.0	66.67	26.67	6.54	59.94	18.59	28.74
	STD.DEV	0.00	0.00	46.19	0.00	40.41	34.77	44.56
38260 MBAS	NO.POTW	2.00	2.00	5.00	2.00	6.00	3.00	1.00
MG/L	MAX	90.80	19.15	78.24	89.27	93.52	83.33	88.85
	MIN	10.67	16.67	35.43	71.65	33.76	38.24	88.85
	MEAN	50.76	17.91	60.40	80.46	63.70	58.12	88.85
	STD.DEV	56.71	1.76	22.05	12.46	24.52	23.02	0.00
01032 HEXAVALENT	NO.POTW	3.00	0.0	5.00	1.00	4.00	10.00	3.00
CHROMIUM, UG/L AS CR	MAX	0.0	0.0	60.00	0.0	54.29	75.00	0.0
	MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.0	0.0	29.45	0.0	13.57	14.42	0.0
	STD.DEV	********	0.0	30.02	0.00	27.14	30.44	********
00605 NITROGEN,	NO.POTW	10.00	0.0	6.00	3.00	13.00	2.00	0.0
ORGANIC MG/L	MAX	69.23	0.0	75.00	65.93	94.60	72.16	0.0
	MIN	1.17	0.0	0.0	11.76	14.49	23.91	0.0
	MEAN	39.71	0.0	47.21	36.67	67.61	48.04	0.0
	STD.DEV	23.53	0.0	28.19	27.34	24.76	34.12	0.0
00666 DISSOLVED	NO.POTW	1.00	0.0	1.00	0.0	2.00	1.00	0.0
PHOSPHORUS MG/L	MAX	0.0	0.0	14.81	0.0	49.15	0.0	0.0
	MIN	0.0	0.0	14.81	0.0	43.42	0.0	0.0
	MEAN	0.0	0.0	14.81	0.0	46.29	0.0	0.0
	STD.DEV	0.00	0.0	0.00	0.0	4.05	0.00	0.0
01040 COPPER,	NO.POTW	23.00	1.00	6.00	4.00	7.00	1.00	0.0
DISSOLVED MG/L AS CU	MAX	45.00	30.30	62.50	25.00	87.50	66.67	0.0
	MIN	0.0	30.30	0.0	0.0.	12.50	66.67	0.0
	MEAN	18.74	30.30	37.24	13.04	56.09	66.67	0.0
	STD.DEV	17.07	0.00	23.09	11.49	28.97	0.00	0.0

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REPORT NO.5                                          POTW REMOVAL DATA ANALYSIS BY PLANT          PAGE  5            5/23/75
NOTE: NEGATIVE REMOVALS DELETED

IPARAMETERS              CATEGORY      A1        OTHER A        B1        OTHER B        C1      OTHER C        MISC(D,J)
V                        --------
01030     CHROMIUM,      NO.POTW     28.00        0.0         6.00         4.00        9.00       1.00          0.0
DISSOLVED MG/L AS CR       MAX       80.65        0.0        50.00        88.89       65.67       0.0           0.0
                           MIN        0.0         0.0         0.0          0.0         0.0        0.0           0.0
                           MEAN      15.59        0.0         8.33        34.72       22.61       0.0           0.0
                         STD.DEV     22.92        0.0        20.41        43.12       28.92       0.00          0.0

01049     LEAD,          NO.POTW     31.00        1.00        6.00         4.00        9.00       1.00          0.0
DISSOLVED MG/L AS PB       MAX       66.67        0.0        90.00        50.00        0.0        0.0           0.0
                           MIN        0.0         0.0         0.0          0.0         0.0        0.0           0.0
                           MEAN      10.22        0.0        33.06        12.50        0.0        0.0           0.0
                         STD.DEV     21.81        0.00       40.69        25.00      *******      0.00          0.0

01065     NICKEL,        NO.POTW     29.00        1.00        6.00         4.00        9.00       1.00          0.0
DISSOLVED MG/L AS NI       MAX       50.00        0.0         0.0          0.0        55.56       0.0           0.0
                           MIN        0.0         0.0         0.0          0.0         0.0        0.0           0.0
                           MEAN       4.09        0.0         0.0          0.0        12.23       0.0           0.0
                         STD.DEV     12.58        0.00      *******      *******      24.28       0.00          0.0

01025     CADMIUM,       NO.POTW     31.00        1.00        6.00         4.00        9.00       1.00          0.0
DISSOLVED MG/L AS CD       MAX       25.00        0.0         0.0          0.0        57.14       0.0           0.0
                           MIN        0.0         0.0         0.0          0.0         0.0        0.0           0.0
                           MEAN       0.81        0.0         0.0          0.0        11.90       0.0           0.0
                         STD.DEV      4.49        0.00      *******      *******      23.69       0.00          0.0

01056     MANGANESE,     NO.POTW     18.00        0.0         5.00         4.00        5.00       1.00          0.0
DISSOLVED MG/L AS MN       MAX       21.43        0.0        35.71        26.67       92.86      71.43          0.0
                           MIN        0.0         0.0         0.0          0.0         0.0       71.43          0.0
                           MEAN       5.65        0.0        12.14        12.51       34.57      71.43          0.0
                         STD.DEV      7.14        0.0        17.05        11.13       37.57       0.00          0.0

71890     MERCURY,       NO.POTW     20.00        0.0         2.00         2.00        7.00       1.00          0.0
DISSOLVED MG/L AS HG       MAX       84.21        0.0        50.00        50.00       14.29       0.0           0.0
                           MIN        0.0         0.0        22.22         0.0         0.0        0.0           0.0
                           MEAN      21.28        0.0        36.11        25.00        2.04       0.0           0.0
                         STD.DEV     26.16        0.0        19.64        35.36        5.40       0.00          0.0

70507     TOT ORTHO-     NO.POTW     22.00        0.0         4.00         5.00        8.00       1.00          0.0
PHOSPHATE      MG/L        MAX       82.93        0.0        25.42        70.83       63.64      99.05          0.0
                           MIN        0.0         0.0         9.09        12.14        2.33      99.05          0.0
                           MEAN      27.12        0.0        16.15        32.61       38.43      99.05          0.0
                         STD.DEV     20.71        0.0         6.82        23.77       22.45       0.00          0.0

00680     TOT CARBON     NO.POTW     26.00        1.00        5.00         4.00        4.00       1.00          0.0
          MG/L AS C        MAX       57.01        5.97       83.80        64.44       61.33      90.16          0.0
                           MIN        0.0         5.97       52.09        42.22       34.02      90.16          0.0
                           MEAN      22.29        5.97       68.35        50.60       52.29      90.16          0.0
                         STD.DEV     18.05        0.00       12.71         9.87       12.76       0.00          0.0
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REPORT NO.5
NOTE: NEGATIVE REMOVALS DELETED                         POTW REMOVAL DATA ANALYSIS BY PLANT               PAGE  6        5/23/75

|PARAMETERS               CATEGORY
V                         -------->      A1      OTHER A       B1     OTHER B       C1     OTHER C    MISC(D,J)
00650       TOTAL         NO.POTW      12.00      1.00        5.00      6.00        7.00      1.00       0.0
PHOSPHATE          MG/L     MAX        46.55     26.87       53.57     69.33       63.16     89.52       0.0
                            MIN         1.56     26.87        1.35      0.0        16.98     89.52       0.0
                            MEAN       21.52     26.87       29.96     25.47       32.54     89.52       0.0
                            STD.DEV    13.24      0.00       22.23     25.01       16.62      0.00       0.0

00671       DISSOLVED     NO.POTW       2.00      0.0         3.00      0.0         2.00      0.0        0.0
ORTHOPHOSPHATE  MG/L        MAX        20.00      0.0        50.59      0.0        96.80      0.0        0.0
                            MIN         7.89      0.0         2.17      0.0        84.21      0.0        0.0
                            MEAN       13.95      0.0        24.13      0.0        90.51      0.0        0.0
                            STD.DEV     8.56      0.0        24.52      0.0         8.90      0.0        0.0

01037       COBALT,TOT    NO.POTW       0.0       2.00        0.0       0.0         0.0       2.00       0.0
            UG/L AS CO      MAX         0.0      60.00        0.0       0.0         0.0       0.0        0.0
                            MIN         0.0       0.0         0.0       0.0         0.0       0.0        0.0
                            MEAN        0.0      30.00        0.0       0.0         0.0       0.0        0.0
                            STD.DEV     0.0      42.43        0.0       0.0         0.0    *******       0.0

01007       BARIUM,TOT    NO.POTW       1.00      0.0         0.0       1.00        0.0       1.00       0.0
            UG/L AS BA      MAX         0.0       0.0         0.0      54.55        0.0      14.71       0.0
                            MIN         0.0       0.0         0.0      54.55        0.0      14.71       0.0
                            MEAN        0.0       0.0         0.0      54.55        0.0      14.71       0.0
                            STD.DEV     0.00      0.0         0.0       0.00        0.0       0.00       0.0
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REPORT NO.6

SUMMARY OF POTW REMOVAL DATA

PAGE 1 6/ 6/75

/PARAMETERS V		CATEGORY ---->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
00550	OIL-GREASE	NO.POTW	6.0000	5.0000	4.0000	9.0000	0.0	17.0000
TOT-SXLT	MG/L	MAX	90.1376	73.8407	88.4852	88.4852	0.0	92.8571
		MIN	12.5000	22.0000	9.2872	9.2872	0.0	9.2872
		MEAN	48.0490	51.8851	66.5686	58.4111	0.0	56.3845
		STD.DEV	29.6907	21.7001	38.2612	29.0570	0.0	28.4696
00556	OIL-GREASE	NO.POTW	0.0	1.0000	3.0000	4.0000	1.0000	5.0000
SEP-FUNNEL	MG/L	MAX	0.0	95.5000	90.0000	95.5000	90.0000	95.5000
		MIN	0.0	95.5000	84.0000	84.0000	90.0000	84.0000
		MEAN	0.0	95.5000	87.1667	89.2500	90.0000	89.1777
		STD.DEV	0.0	0.0000	3.0156	4.8379	0.0000	4.1947
00560	OIL-GREASE	NO.POTW	0.0	0.0	0.0	0.0	0.0	0.0
INFRARED	MG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.0	0.0	0.0
		STD.DEV	0.0	0.0	0.0	0.0	0.0	0.0
00500	RESIDUE	NO.POTW	25.0000	41.0000	29.0000	70.0000	9.0000	102.0000
TOTAL, TS	MG/L	MAX	44.8193	63.3333	63.9134	63.9134	52.2388	63.9134
		MIN	0.1980	0.6211	5.1095	0.6211	5.4616	0.0
		MEAN	17.9075	26.9446	27.0552	26.9904	24.8250	24.7855
		STD.DEV	14.1806	14.4746	16.4159	15.1925	14.3667	15.5400
00530	RESIDUE	NO.POTW	47.0000	66.0000	62.0000	128.0000	31.0000	200.0000
TOT NFLT, SS	MG/L	MAX	91.8919	97.4212	98.5437	98.5437	98.5437	98.5437
		MIN	16.7083	19.7183	8.5714	8.5714	87.3134	8.5714
		MEAN	51.0116	74.6986	75.1669	74.9249	93.5479	69.8022
		STD.DEV	17.9246	19.1476	21.7615	20.3787	3.2612	22.1670
00310	BOD	NO.POTW	52.0000	60.0000	65.0000	125.0000	31.0000	199.0000
5DAY	MG/L	MAX	88.7006	96.4602	99.2188	99.2188	98.3193	99.2188
		MIN	0.0	4.7619	17.8571	4.7619	85.4430	0.0
		MEAN	30.2367	77.4453	83.8410	80.7705	93.1482	67.7471
		STD.DEV	21.7091	17.7546	15.2908	16.7645	4.1688	29.1271
00340	COD	NO.POTW	15.0000	27.0000	27.0000	54.0000	15.0000	84.0000
HI LEVEL	MG/L	MAX	81.7721	93.3232	92.8571	93.3232	93.0295	93.5206
		MIN	4.6835	34.3750	23.7037	23.7037	23.7037	4.6835
		MEAN	29.4072	68.5252	74.1641	71.3447	79.2360	64.3905
		STD.DEV	22.9731	15.1302	15.7923	15.5823	18.1649	23.8339
00335	COD	NO.POTW	1.0000	0.0	3.0000	3.0000	2.0000	5.0000
LOW LEVEL	MG/L	MAX	19.3925	0.0	94.8148	94.8148	94.8148	94.8148
		MIN	19.3925	0.0	72.1311	72.1311	91.7241	19.3925
		MEAN	19.3925	0.0	86.2233	86.2233	93.2695	73.5384
		STD.DEV	0.0000	0.0	12.3027	12.3028	2.1893	31.5282

NOTES:
1) NEGATIVE REMOVALS DELETED
2) PRIMARY (A) INCLUDES A01,A02
3) TRICKLING FILTER (B) INCLUDES B01,B02,B04,B05
4) ACTIVATED SLUDGE (C) INCLUDES C01,C02,C05,C06,C09,C19,C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L
AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

SUMMARY OF POTW REMOVAL DATA

/PARAMETERS V	CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
00342 SEA COD SALINE MG/L	NO.POTW	2.0000	9.0000	10.0000	19.0000	3.0000	24.0000
	MAX	19.3925	95.3964	93.3511	95.3964	93.3511	95.3964
	MIN	0.0	48.1967	52.3416	48.1967	87.0886	0.0
	MEAN	9.6963	76.8786	76.2544	76.5501	89.1760	72.4863
	STD.DEV	13.7126	15.2534	12.7352	13.5864	3.6164	23.3288
32730 PHENOLICS 4AAP DISTIL UG/L	NO.POTW	2.0000	12.0000	16.0000	28.0000	7.0000	37.0000
	MAX	50.0000	85.0000	98.2609	98.2609	96.0526	98.2609
	MIN	25.0000	0.0	0.0	0.0	0.0	0.0
	MEAN	37.5000	50.4891	69.1646	61.1608	64.9988	61.3401
	STD.DEV	17.6776	28.0577	31.2366	30.8442	42.4991	30.5589
00945 SULFATE MG/L	NO.POTW	13.0000	10.0000	13.0000	23.0000	4.0000	41.0000
	MAX	57.8947	79.7422	38.5714	79.7422	25.4237	79.7422
	MIN	0.0	2.8000	0.0	0.0	2.2989	0.0
	MEAN	9.8780	28.3498	11.8723	19.0364	14.7034	17.2660
	STD.DEV	17.1409	21.3001	12.0523	18.2918	10.8557	20.1632
00665 TOTAL PHOSPHORUS MG/L	NO.POTW	7.0000	24.0000	36.0000	60.0000	18.0000	81.0000
	MAX	24.2991	99.4185	92.3077	99.4185	92.3077	99.4185
	MIN	0.0	0.0	0.0	0.0	6.5367	0.0
	MEAN	13.2186	25.6007	41.9167	35.3903	47.4827	37.8046
	STD.DEV	8.1411	21.9699	24.9894	24.9716	27.1234	26.2613
00610 NITROGEN, AMMONIA MG/L	NO.POTW	42.0000	48.0000	47.0000	95.0000	26.0000	157.0000
	MAX	64.2857	99.4941	99.7015	99.7015	99.7015	99.7015
	MIN	0.0	0.0	3.7879	0.0	3.7879	0.0
	MEAN	19.7504	41.0735	48.7321	44.8624	65.3043	39.9600
	STD.DEV	16.0708	29.8591	31.3228	30.6713	33.9926	31.1176
00625 NITROGEN, KJELDAHL, TOTAL MG/L	NO.POTW	7.0000	20.0000	11.0000	31.0000	3.0000	47.0000
	MAX	59.7222	93.6842	91.6667	93.6842	91.6667	93.6842
	MIN	0.0	7.0000	4.5455	4.5455	36.3636	0.0
	MEAN	21.7594	49.9227	34.0453	44.2887	71.1143	44.3923
	STD.DEV	20.0055	27.3765	26.4399	27.7004	30.2623	28.6991

NOTES:
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AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

SUMMARY OF POTW REMOVAL DATA

/PARAMETERS V	CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01002 TOT ARSENIC	NO.POTW	1.0000	3.0000	5.0000	8.0000	2.0000	12.0000
AS UG/L	MAX	0.0	33.3333	60.0000	60.0000	60.0000	60.0000
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.0	11.1111	24.0000	19.1667	30.0000	20.4167
	STD.DEV	0.0000	19.2450	32.8634	27.7030	42.4264	26.6678
01027 TOT CADMIUM	NO.POTW	31.0000	35.0000	44.0000	79.0000	11.0000	122.0000
CD UG/L	MAX	76.4706	75.0000	87.6923	87.6923	53.8461	87.6923
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	8.2248	19.8551	16.7704	18.1370	9.6497	15.1049
	STD.DEV	17.2113	24.9946	26.9183	25.9644	21.4719	24.1799
01034 TOT CHROMIUM	NO.POTW	36.0000	48.0000	54.0000	102.0000	20.0000	154.0000
CR UG/L	MAX	80.0000	98.9412	98.3333	98.9412	98.3333	98.9412
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	26.0159	37.6953	46.3708	42.2882	52.4383	38.7910
	STD.DEV	26.1279	30.2658	33.9051	32.3797	39.3630	31.8146
01051 TOT LEAD	NO.POTW	34.0000	41.0000	49.0000	90.0000	19.0000	145.0000
PB UG/L	MAX	88.2353	93.4193	95.0000	95.0000	95.0000	95.0000
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	24.1034	37.0009	38.5565	37.8478	45.9701	34.2641
	STD.DEV	26.3064	31.2869	32.2960	31.6716	35.3599	31.0457
71900 TOT MERCURY	NO.POTW	21.0000	20.0000	34.0000	54.0000	14.0000	86.0000
HG UG/L	MAX	75.0000	66.6667	99.5833	99.5833	81.2500	99.5833
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	26.9503	30.3073	38.7528	35.6248	49.2762	32.5740
	STD.DEV	28.6170	23.4209	32.1854	29.3016	21.4477	28.5871
01042 TOT COPPER	NO.POTW	44.0000	49.0000	63.0000	112.0000	22.0000	172.0000
CU UG/L	MAX	77.2727	95.2294	95.1613	95.2294	92.3077	95.8333
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	25.5771	54.1968	57.1917	55.8810	69.2626	49.5492
	STD.DEV	24.0147	24.2583	24.2747	24.2045	22.6787	27.8885
01097 TOT ANTIMONY	NO.POTW	0.0	0.0	0.0	0.0	0.0	1.0000
UG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.0	0.0	0.0	0.0	0.0	0.0
	STD.DEV	0.0	0.0	0.0	0.0	0.0	0.0000
01067 TOT NICKEL	NO.POTW	28.0000	32.0000	49.0000	81.0060	16.0000	124.0000
NI UG/L	MAX	92.1875	86.3855	80.0000	86.3855	37.5000	96.6667
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	6.2990	21.4848	20.4195	20.8404	8.9410	19.6489
	STD.DEV	18.4166	23.9625	21.3254	22.2630	14.6326	24.7609

NOTES:
1) NEGATIVE REMOVALS DELETED
2) PRIMARY (A) INCLUDES A01.A02
3) TRICKLING FILTER (B) INCLUDES B01.B02.B04.B05
4) ACTIVATED SLUDGE (C) INCLUDES C01.C02.C05.C06.C09.C19.C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

REPORT NO.6

SUMMARY OF POTW REMOVAL DATA

PAGE 4 6/ 6/75

/PARAMETERS V		CATEGORY	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01147 TOT SELENIUM		NO.POTW	0.0	0.0	2.0000	2.0000	1.0000	5.0000
	UG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.0	0.0	0.0
		STD.DEV	0.0	0.0	**********	**********	0.0000	**********
01077 TOT SILVER AG	UG/L	NO.POTW	0.0	1.0000	0.0	1.0000	0.0	3.0000
		MAX	0.0	33.3333	0.0	33.3333	0.0	33.3333
		MIN	0.0	33.3333	0.0	33.3333	0.0	0.0
		MEAN	0.0	33.3333	0.0	33.3333	0.0	11.1111
		STD.DEV	0.0	0.0000	0.0	0.0000	0.0	19.2450
01092 TOT ZINC ZN	UG/L	NO.POTW	38.0000	52.0000	58.0000	110.0000	19.0000	167.0000
		MAX	88.0000	88.5714	99.2857	99.2857	99.2857	99.2857
		MIN	0.0	0.0	0.0	0.0	42.1053	0.0
		MEAN	31.0493	46.2715	58.3914	52.6615	71.3264	48.8794
		STD.DEV	22.9848	22.0986	25.1160	24.4006	14.9530	26.4544
01102 TOT TIN		NO.POTW	0.0	0.0	3.0000	3.0000	0.0	5.0000
	UG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.C	0.0	0.0
		STD.DEV	0.0	0.0	**********	**********	0.0	**********
00680 TOT ORG CARBON TOTAL,TOC	MG/L	NO.POTW	30.0000	23.0000	13.0000	36.0000	8.0000	75.0000
		MAX	56.4270	84.1346	89.3617	89.3617	89.3617	89.3617
		MIN	0.0	8.0824	41.9355	8.0824	72.0779	0.0
		MEAN	23.9512	63.5019	73.1626	66.9904	79.1304	49.1584
		STD.DEV	17.8074	17.7721	12.2421	16.4939	6.8380	27.4015

NOTES:
1) NEGATIVE REMOVALS DELETED
2) PRIMARY (A) INCLUDES A01,A02
3) TRICKLING FILTER (B) INCLUDES B01,B02,B04,B05
4) ACTIVATED SLUDGE (C) INCLUDES C01,C02,C05,C06,C09,C19,C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

SUMMARY OF POTW REMOVAL DATA

/PARAMETERS V	CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01105 TOT ALUMINUM	NO.POTW	1.0000	5.0000	9.0000	14.0000	5.0000	20.0000
AL UG/L	MAX	10.8696	91.0853	80.7692	91.0853	80.7692	97.8723
	MIN	10.8696	0.0	0.0	0.0	0.0	0.0
	MEAN	10.8696	59.4670	31.0498	41.1988	36.3607	42.4248
	STD.DEV	0.0000	38.7336	25.7011	32.6770	30.7257	36.2361
01045 TOT IRON	NO.POTW	27.0000	30.0000	35.0000	65.0000	15.0000	107.0000
FE UG/L	MAX	88.8889	89.8327	97.6744	97.6744	97.6744	97.7340
	MIN	0.0	0.0	7.6965	0.0	37.5000	0.0
	MEAN	39.6611	49.6736	63.0609	56.8822	79.3918	54.4198
	STD.DEV	22.0123	25.7745	27.0891	27.1318	17.1486	27.9096
01055 TOT MANGANESE	NO.POTW	16.0000	21.0000	19.0000	40.0000	16.0000	66.0000
MN UG/L	MAX	81.2500	71.9512	93.4641	93.4641	93.4641	93.4641
	MIN	0.0	0.0	0.0	0.0	13.8462	0.0
	MEAN	14.6363	31.1776	38.0421	34.4382	47.1870	31.2223
	STD.DEV	20.4798	23.2465	31.5947	27.3842	30.3930	27.2164
00720 CYANIDE,	NO.POTW	1.0000	4.0000	10.0000	14.0000	5.0000	22.0000
TOTAL MG/L	MAX	0.0	80.0000	98.2143	98.2143	98.2143	98.2143
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.0	21.6355	32.4716	29.3755	48.8868	30.8839
	STD.DEV	0.0000	39.0317	40.2475	38.7146	41.0122	38.9021
38260 MBAS	NO.POTW	4.0000	7.0000	8.0000	15.0000	2.0000	21.0000
MG/L	MAX	90.8602	89.2733	93.5233	93.5233	91.5385	93.5233
	MIN	10.6667	35.4305	33.7553	33.7553	50.0000	10.6667
	MEAN	34.3356	66.1342	59.1519	62.4103	70.7692	59.3179
	STD.DEV	37.8509	21.1108	22.7038	21.4882	29.3719	27.2496

NOTES:
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5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L
AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

REPORT NO.6

SUMMARY OF POTW REMOVAL DATA

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/PARAMETERS #	CATEGORY	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01032 HEXAVALENT CHROMIUM, UG/L AS CR	NO.POTW	3.0000	6.0000	13.0000	19.0000	5.0000	27.0000
	MAX	0.0	60.0000	75.0000	75.0000	0.0	75.0000
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.0	24.5454	15.2705	18.1994	0.0	12.8070
	STD.DEV	**********	29.4242	29.3448	28.8824	**********	25.4801
00605 NITROGEN, ORGANIC MG/L	NO.POTW	10.0000	8.0000	15.0000	23.0000	5.0000	34.0000
	MAX	69.2308	75.0000	94.6000	94.6000	94.6000	94.6000
	MIN	1.1606	0.0	14.4928	0.0	58.9743	0.0
	MEAN	39.7083	47.6869	65.0046	58.9810	80.9077	51.9238
	STD.DEV	23.5323	25.4775	25.6135	26.3655	15.0376	27.2627
00666 DISSOLVED PHOSPHORUS MG/L	NO.POTW	1.0000	1.0000	3.0000	4.0000	0.0	5.0000
	MAX	0.0	14.8148	49.1525	49.1525	0.0	49.1525
	MIN	0.0	14.8148	0.0	0.0	0.0	0.0
	MEAN	0.0	14.8148	30.8578	26.8471	0.0	21.4777
	STD.DEV	0.0000	0.0000	26.8769	23.3650	0.0	23.5286
01040 COPPER, DISSOLVED MG/L AS CU	NO.POTW	23.0000	10.0000	8.0000	18.0000	6.0000	42.0000
	MAX	65.0000	62.5000	87.5000	87.5000	87.5000	87.5000
	MIN	0.0	0.0	12.5000	0.0	25.0000	0.0
	MEAN	18.7356	27.5574	57.4091	40.8248	65.3521	28.4778
	STD.DEV	17.0688	22.2836	27.0812	28.2462	22.0187	24.6455
01090 ZINC, DISSOLVED MG/L AS ZN	NO.POTW	21.0000	7.0000	7.0000	14.0000	4.0000	36.0000
	MAX	71.4286	60.0000	87.5000	87.5000	87.5000	87.5000
	MIN	0.0	0.0	14.2857	0.0	45.4545	0.0
	MEAN	25.3454	39.9350	53.6482	46.7916	69.9053	33.1986
	STD.DEV	18.1713	20.9625	31.8898	26.8851	20.7082	24.2174
01030 CHROMIUM, DISSOLVED MG/L AS CR	NO.POTW	28.0000	10.0000	10.0000	20.0000	6.0000	48.0000
	MAX	80.6452	88.8889	65.6716	88.8889	88.8889	88.8889
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	15.5888	18.8889	20.3526	19.6207	33.4046	17.2687
	STD.DEV	22.9836	32.2030	28.1859	29.4636	38.7118	25.6291
01049 LEAD, DISSOLVED MG/L AS PB	NO.POTW	31.0000	10.0000	10.0000	20.0000	6.0000	52.0000
	MAX	66.6667	90.0000	0.0	90.0000	50.0000	90.0000
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	[illegible]	10.2183	24.8333	0.0	12.4167	13.8889	10.8654
	[illegible]	21.0061	35.2881	**********	27.3886	22.1527	23.7211

NOTES:
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5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L
AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

/PARAMETERS	CATEGORY	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01065 NICKEL,	NO.POTW	29.0000	10.0000	10.0000	20.0000	6.0000	50.0000
DISSOLVED MG/L AS NI	MAX	50.0000	0.0	55.5555	55.5555	0.0	55.5555
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	4.0887	0.0	11.0181	5.5050	0.0	4.5734
	STD.DEV	12.5805	***********	23.2125	16.9450	***********	14.2371
01025 CADMIUM,	NO.POTW	31.0000	10.0000	10.0000	20.0000	6.0000	52.0000
DISSOLVED MG/L AS CD	MAX	25.0000	0.0	57.1429	57.1429	50.0000	57.1429
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.8065	0.0	10.7143	5.3571	8.3333	2.5412
	STD.DEV	4.4901	***********	22.6503	16.5296	20.4124	10.8957
01056 MANGANESE,	NO.POTW	18.0000	9.0000	6.0000	15.0000	4.0000	33.0000
DISSOLVED MG/L AS MN	MAX	21.4286	35.7143	92.8571	92.8571	92.8571	92.8571
	MIN	0.0	0.0	0.0	0.0	20.0000	0.0
	MEAN	5.6515	12.3064	40.7143	23.6695	47.3810	13.8415
	STD.DEV	7.1377	13.8533	36.8280	28.3084	32.9329	21.4632
71890 MERCURY,	NO.POTW	20.0000	4.0000	8.0000	12.0000	3.0000	32.0000
DISSOLVED MG/L AS HG	MAX	84.2105	50.0000	14.2857	50.0000	0.0	84.2105
	MIN	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	21.2799	30.5555	1.7857	11.3757	0.0	17.5658
	STD.DEV	26.1570	24.2161	5.0508	19.4119	***********	24.0163
70507 TOT ORTHO-	NO.POTW	22.0000	9.0000	9.0000	18.0000	4.0000	40.0000
PHOSPHATE MG/L	MAX	82.9268	76.8333	99.0476	99.0476	58.3333	99.0476
	MIN	0.0	9.0909	2.3256	2.3256	40.0000	0.0
	MEAN	27.1162	25.2945	45.1609	35.2277	47.2083	30.7663
	STD.DEV	20.7055	19.3681	29.1433	26.0900	8.1347	23.3294
00690 TOT CARBON	NO.POTW	26.0000	9.0000	5.0000	14.0000	4.0000	41.0000
MG/L AS C	MAX	57.0111	83.7956	90.1639	90.1639	64.5833	90.1639
	MIN	0.0	42.2222	34.0206	34.0206	60.7843	0.0
	MEAN	22.2897	60.4625	59.8665	60.2496	62.7863	34.8535
	STD.DEV	18.0518	14.3129	20.2218	15.8738	2.0065	25.1943

NOTES:
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REPORT NO.6

SUMMARY OF POTW REMOVAL DATA

/PARAMETERS V		CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
00650	TOTAL PHOSPHATE MG/L	NO.POTW	13.0000	11.0000	8.0000	19.0000	0.0	32.0000
		MAX	46.5517	69.3333	89.5238	89.5238	0.0	89.5238
		MIN	1.5625	0.0	16.9811	0.0	0.0	0.0
		MEAN	21.9299	27.5111	39.6647	32.6284	0.0	28.2821
		STD.DEV	12.7638	22.7160	25.3521	23.9716	0.0	20.6210
00671	DISSOLVED ORTHOPHOSPHATE MG/L	NO.POTW	2.0000	3.0000	2.0000	5.0000	2.0000	7.0000
		MAX	20.0000	50.5882	96.8000	96.8000	96.8000	96.8000
		MIN	7.8947	2.1739	84.2105	2.1739	84.2105	2.1739
		MEAN	13.9474	24.1350	90.5053	50.6831	90.5053	40.1871
		STD.DEV	8.5597	24.5178	8.9022	40.5201	8.9027	37.7903
01037	COBALT,TOT UG/L AS CO	NO.POTW	2.0000	0.0	2.0000	2.0000	0.0	4.0000
		MAX	60.0000	0.0	0.0	0.0	0.0	60.0000
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	30.0000	0.0	0.0	0.0	0.0	15.0000
		STD.DEV	42.4264	0.0	**********	**********	0.0	30.0000
01007	BARIUM,TOT UG/L AS BA	NO.POTW	1.0000	1.0000	1.0000	2.0000	0.0	3.0000
		MAX	0.0	54.5455	14.7059	54.5455	0.0	54.5455
		MIN	0.0	54.5455	14.7059	14.7059	0.0	0.0
		MEAN	0.0	54.5455	14.7059	34.6257	0.0	23.0838
		STD.DEV	0.0000	0.0000	0.0000	28.1708	0.0	28.2213

NOTES:
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REPORT NO.7                                               POTW EFFLUENT DATA ANALYSIS                PAGE  1           5/23/75
!PARAMETERS           CATEGORY       A1          OTHER A          B1          OTHER B          C1          OTHER C          MISC(D,J)
V                     ------->
[illegible]   OIL-GREASE  NO.POTW     5.0000       1.0000       5.0000       6.0000       7.0000       5.0000       0.0
[illegible]         MG/L     MAX     44.0000      21.5000      72.0000      37.8000     130.0000      58.5000       0.0
                             MIN     19.0000      21.5000       4.0000       5.0000       6.0000       1.0000       0.0
                            MEAN     29.1000      21.5000      25.8000      17.2000      36.9143      19.5200       0.0
                         STD.DEV      9.8387       0.0000      27.0106      13.5422      43.5760      24.7896       0.0

00556     OIL-GREASE  NO.POTW         0.0          0.0          3.0000       0.0          0.0          4.0000       1.0000
SEP-FUNNEL      MG/L      MAX         0.0          0.0          9.0000       0.0          0.0          8.0000       5.0000
                          MIN         0.0          0.0          1.0000       0.0          0.0          1.0000       5.0000
                         MEAN         0.0          0.0          4.1667       0.0          0.0          4.7500       5.0000
                      STD.DEV         0.0          0.0          4.2525       0.0          0.0          2.8723       0.0000

00560     OIL-GREASE  NO.POTW         0.0          0.0          0.0          0.0          0.0          0.0          0.0
INFRARED        MG/L      MAX         0.0          0.0          0.0          0.0          0.0          0.0          0.0
                          MIN         0.0          0.0          0.0          0.0          0.0          0.0          0.0
                         MEAN         0.0          0.0          0.0          0.0          0.0          0.0          0.0
                      STD.DEV         0.0          0.0          0.0          0.0          0.0          0.0          0.0

00500     RESIDUE     NO.POTW        25.0000       6.0000      21.0000      25.0000      22.0000      15.0000       3.0000
TOTAL, TS       MG/L      MAX      1842.0000    1269.0000    2034.0000    3030.0000    3440.0000    1980.0000     770.0000
                          MIN       346.0000     400.0000     300.0000      40.0000     294.0000     371.0000     630.0000
                         MEAN       678.4800     684.0000     697.3809     666.9678     741.3635     716.0000     689.3333
                      STD.DEV       372.0469     334.3118     472.4102     572.1072     701.6296     388.2290      72.3948

00530     RESIDUE     NO.POTW        49.0000       8.0000      32.0000      37.0000      42.0000      30.0000       9.0000
TOT NFLT, SS    MG/L      MAX       314.0000     161.0000     228.0000     196.0000     175.0000     183.0000      94.0000
                          MIN        15.0000      85.5000       5.0000       6.0000       2.0000       4.0000       3.0000
                         MEAN        90.9428     110.5625      47.2813      41.4297      32.4286      37.9767      20.5555
                      STD.DEV        64.5526      25.2321      44.1930      38.2320      31.8795      45.9761      33.1176

00310     BOD         NO.POTW        54.0000       6.0000      32.0000      33.0000      41.0000      31.0000       9.0000
5DAY            MG/L      MAX       650.0000     300.0000     245.0000     180.0000     200.0000     230.0000     131.0000
                          MIN        20.0000      51.0000       8.0000       2.2000       3.0000       2.0000       2.0000
                         MEAN       166.3759     198.6667      51.1875      47.6848      27.7707      25.2516      23.2000
                      STD.DEV       111.5490      94.6983      55.8103      43.2595      37.4381      41.5822      41.8200

00340     COD         NO.POTW        11.0000       6.0000      15.0000      15.0000      20.0000      13.0000       5.0000
HI LEVEL        MG/L      MAX       768.0000     555.0000     210.0000     370.0000     275.0000     148.0000     329.0000
                          MIN        58.0000     147.0000      26.0000      32.0000      31.7000      14.3000      53.0000
                         MEAN       351.7271     292.1665     109.5667     176.3333     109.1250      55.0231     139.8000
                     'STD.DEV       248.0525     152.9436      56.9887     106.6633      70.1036      32.5391     111.2617

[illegible]  COD      NO.POTW         1.0000       0.0          1.0000       0.0          1.0000       4.0000       1.0000
LOW-LEVEL       MG/L      MAX       345.0000       0.0         66.0000       0.0         24.0000      51.0000      28.0000
                          MIN       345.0000       0.0         66.0000       0.0         24.0000      14.0000      28.0000
                         MEAN       345.0000       0.0         66.0000       0.0         24.0000      28.7500      28.0000
                      STD.DEV         0.0000       0.0          0.0000       0.0          0.0000      15.7982       0.0000

[illegible]  [illegible]  NO.POTW     2.0000       0.0          3.0000       6.0000       6.0000       4.0000       2.0000
[illegible]     MG/L      MAX       [illegible]    0.0        315.0000     158.0000     173.0000     119.0000      32.0000
                          MIN       [illegible]    0.0        102.0000      18.0000      16.0000      29.0000      28.0000
                         MEAN       429.5000       0.0        177.6667      95.3333      84.6667      81.0000      30.0000
                      STD.DEV       119.5031       0.0        119.1401      61.9439      71.4554      38.6781       2.8283
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REPORT NO.7

POTW EFFLUENT DATA ANALYSIS

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IPARAMETERS V	CATEGORY ------->	A1	OTHER A	B1	OTHER B	C1	OTHER C	MISC(D,J)
32730 PHENOLICS 4AAP DISTIL UG/L	NO.POTW	4.0000	4.0000	8.0000	7.0000	9.0000	11.0000	5.0000
	MAX	53.0000	45.0000	3000.0000	24.0000	2000.0000	353.0000	30000.0000
	MIN	0.1000	0.1500	0.0300	0.0300	0.0200	0.0400	2.0000
	MEAN	13.4750	22.2875	385.6873	6.7671	226.4699	35.6400	6003.1992
	STD.DEV	26.3504	19.1841	1056.4651	9.4492	665.1030	105.2899	13414.5742
00945 SULFATE MG/L	NO.POTW	17.0000	2.0000	11.0000	7.0000	14.0000	15.0000	3.0000
	MAX	150.0000	150.0000	243.0000	454.0000	223.0000	470.0000	400.0000
	MIN	26.0000	72.0000	38.0000	22.0000	33.0000	17.0000	136.0000
	MEAN	64.1765	111.0000	73.7273	177.4286	88.7857	134.6000	254.6667
	STD.DEV	32.5311	55.1543	57.5257	189.1868	68.8778	102.7121	134.0049
00940 CHLORIDE CL MG/L	NO.POTW	38.0000	6.0000	18.0000	16.0000	22.0000	17.0000	4.0000
	MAX	2169.0000	290.0000	330.0000	990.0000	1561.0000	610.0000	410.0000
	MIN	43.0000	60.0000	32.0000	36.0000	43.0000	43.8000	148.0000
	MEAN	313.2419	123.5000	112.1667	172.9062	256.4497	210.1647	274.5000
	STD.DEV	433.4438	84.8356	71.1063	251.3995	342.6404	175.1463	109.8527
00665 TOTAL PHOSPHORUS MG/L	NO.POTW	8.0000	3.0000	17.0000	13.0000	23.0000	23.0000	6.0000
	MAX	77.0000	10.0000	18.3000	20.0000	10.4000	10.3000	8.7800
	MIN	1.3400	4.0000	3.2700	1.6000	1.0000	0.4600	2.7000
	MEAN	15.1775	6.0167	8.7706	9.0685	4.1930	5.4317	5.9600
	STD.DEV	25.1363	3.4498	3.8594	5.5395	2.3527	3.1812	2.4041
00630 NITROGEN, NO2-NO3 MG/L	NO.POTW	2.0000	0.0	11.0000	10.0000	11.0000	17.0000	3.0000
	MAX	10.0000	0.0	16.0000	23.8000	7.8000	19.9000	13.0000
	MIN	0.0300	0.0	0.0260	0.1500	0.0200	0.0300	0.6300
	MEAN	5.0150	0.0	5.1419	7.7250	1.7973	5.2485	8.1100
	STD.DEV	7.0498	0.0	4.9174	7.1650	2.6517	6.2322	6.5791
00610 NITROGEN, AMMONIA MG/L	NO.POTW	59.0000	8.0000	33.0000	35.0000	41.0000	31.0000	8.0000
	MAX	256.5999	24.5000	115.0000	76.0000	26.0000	27.5000	17.8000
	MIN	2.1000	4.3000	0.0300	0.1300	0.2000	0.0700	0.1200
	MEAN	20.7145	14.8500	18.2281	14.7714	11.4107	9.5529	5.3950
	STD.DEV	35.9821	7.1762	19.9891	14.0357	7.2425	8.0652	6.4845
00625 NITROGEN, KJELDAHL, TOTAL MG/L	NO.POTW	7.0000	1.0000	13.0000	10.0000	11.0000	8.0000	0.0
	MAX	47.0000	31.0000	39.0000	46.7500	34.0000	26.2500	0.0
	MIN	8.5000	31.0000	1.2000	2.2000	1.5000	1.6000	0.0
	MEAN	23.4286	31.0000	17.3615	14.6340	18.7809	10.2437	0.0
	STD.DEV	12.2421	0.0000	11.8365	12.6386	10.0763	9.3281	0.0
01002 TOT ARSENIC AS UG/L	NO.POTW	1.0000	0.0	1.0000	4.0000	1.0000	7.0000	0.0
	MAX	2.0000	0.0	2.0000	20.0000	2.0000	5.0000	0.0
	MIN	2.0000	0.0	2.0000	0.5000	2.0000	2.0000	0.0
	MEAN	2.0000	0.0	2.0000	8.3250	2.0000	3.7143	0.0
	STD.DEV	0.0000	0.0	0.0000	8.3679	0.0000	1.6036	0.0
01027 TOT CADMIUM CD UG/L	NO.POTW	30.0000	7.0000	22.0000	22.0000	23.0000	33.0000	6.0000
	MAX	40.0000	480.0000	66.0000	20.0000	20.0000	1970.0000	35.0000
	MIN	3.0000	4.0000	1.0000	1.0000	1.0000	2.0000	1.0000
	MEAN	13.0000	85.2857	12.6954	9.7273	11.2609	69.4151	10.6667
	STD.DEV	8.2795	174.3509	13.7692	5.1193	6.4893	341.2322	12.2583

IPARAMETERS V	CATEGORY ------->	A1	OTHER A	B1	OTHER B	C1	OTHER C	MISC(D,J)
01034 TOT CHROMIUM	NO.POTW	36.0000	9.0000	29.0000	28.0000	32.0000	36.0000	7.0000
CR UG/L	MAX	2600.0000	350.0000	3200.0000	1200.0000	2520.0000	400.0000	600.0000
	MIN	5.0000	14.0000	9.0000	3.0000	5.0000	5.0000	10.0000
	MEAN	190.3055	168.6667	327.6206	132.5357	323.7717	57.1583	110.1429
	STD.DEV	442.4038	99.2658	733.8914	262.0610	687.3762	90.6973	216.5660
01051 TOT LEAD	NO.POTW	30.0000	9.0000	23.0000	25.0000	30.0000	30.0000	8.0000
PB UG/L	MAX	1700.0000	386.0000	550.0000	1800.0000	350.0000	200.0000	50.0000
	MIN	10.0000	29.0000	5.0000	9.0000	3.0000	4.0000	12.0000
	MEAN	157.7667	132.2222	94.2174	133.4400	74.2900	51.7767	31.0000
	STD.DEV	297.8857	112.0921	144.7010	355.7373	76.1513	49.1337	10.9021
71900 TOT MERCURY	NO.POTW	21.0000	3.0000	11.0000	14.0000	22.0000	20.0000	5.0000
MG UG/L	MAX	1.6000	5.0000	1.8750	10.0000	200.0000	5.0000	1.7000
	MIN	0.1000	5.0000	0.1000	0.2000	0.1000	0.2000	0.2000
	MEAN	0.6000	5.0000	0.5341	1.2439	9.8091	0.6115	0.5400
	STD.DEV	0.3834	0.0062	0.4897	2.5438	42.4839	1.0692	0.6542
01042 TOT COPPER	NO.POTW	42.0000	7.0000	32.0000	25.0000	40.0000	37.0000	7.0000
CU UG/L	MAX	1700.0000	380.0000	1800.0000	1000.0000	1600.0000	180.0000	152.0000
	MIN	10.0000	40.0000	2.6000	19.0000	10.0000	6.0000	6.0000
	MEAN	199.3333	168.5714	155.4562	99.0400	105.7500	62.6027	32.1429
	STD.DEV	296.0693	110.3505	334.9673	193.3092	254.8947	51.1277	53.0831
01097 TOT ANTIMONY	NO.POTW	0.0	0.0	0.0	0.0	0.0	1.0000	0.0
UG/L	MAX	0.0	0.0	0.0	0.0	0.0	5.0000	0.0
	MIN	0.0	0.0	0.0	0.0	0.0	5.0000	0.0
	MEAN	0.0	0.0	0.0	0.0	0.0	5.0000	0.0
	STD.DEV	0.0	0.0	0.0	0.0	0.0	0.0000	0.0
01067 TOT NICKEL	NO.POTW	27.0000	7.0000	22.0000	21.0000	32.0000	32.0000	6.0000
NI UG/L	MAX	300.0000	1700.0000	1130.0000	1533.0000	1800.0000	40000.0000	240.0000
	MIN	6.0000	18.0000	11.0000	7.0000	3.0000	7.0000	5.0000
	MEAN	69.7407	594.0000	178.1227	197.5238	110.9562	1332.0625	67.3333
	STD.DEV	58.6708	749.7041	292.4619	365.1274	309.5474	7056.5898	86.6525
01147 TOT SELENIUM	NO.POTW	0.0	0.0	0.0	1.0000	1.0000	3.0000	0.0
UG/L	MAX	0.0	0.0	0.0	5.0000	2.0000	5.0000	0.0
	MIN	0.0	0.0	0.0	5.0000	2.0000	2.0000	0.0
	MEAN	0.0	0.0	0.0	5.0000	2.0000	4.0000	0.0
	STD.DEV	0.0	0.0	0.0	0.0000	0.0000	1.7321	0.0
01077 TOT SILVER	NO.POTW	1.0000	0.0	1.0000	2.0000	0.0	1.0000	0.0
AG UG/L	MAX	13.0000	0.0	445.7000	10.0000	0.0	10.0000	0.0
	MIN	13.0000	0.0	445.7000	2.0000	0.0	10.0000	0.0
	MEAN	13.0000	0.0	445.7000	6.0000	0.0	10.0000	0.0
	STD.DEV	0.0000	0.0	0.0000	5.6568	0.0	0.0000	0.0
01092 TOT ZINC	NO.POTW	42.0000	8.0000	33.0000	30.0000	40.0000	37.0000	6.0000
ZN UG/L	MAX	3600.0000	680.0000	2800.0000	1321.0000	1400.0000	800.0000	338.0000
	MIN	30.0000	132.0000	40.0000	20.0000	10.0000	30.0000	9.0000
	MEAN	582.4045	355.2500	347.9695	254.5667	258.8823	188.1702	123.3333
	STD.DEV	703.7622	152.9484	552.8789	319.8511	301.3843	166.0566	151.6491

POTW EFFLUENT DATA ANALYSIS

IPARAMETERS V	CATEGORY ------->	A1	OTHER A	B1	OTHER B	C1	OTHER C	MISC(D;J)
01102 TOT TIN	NO.POTW	0.0	0.0	0.0	1.0000	1.0000	4.0000	0.0
UG/L	MAX	0.0	0.0	0.0	400.0000	12600.0000	400.0000	0.0
	MIN	0.0	0.0	0.0	400.0000	12600.0000	400.0000	0.0
	MEAN	0.0	0.0	0.0	400.0000	12600.0000	400.0000	0.0
	STD.DEV	0.0	0.0	0.0	0.0000	0.0000	0.0	0.0
00680 TOT ORG CARBON	NO.POTW	33.0000	4.0000	8.0000	16.0000	9.0000	8.0000	2.0000
TOTAL.TOC MG/L	MAX	539.0000	228.0000	96.0000	129.0000	95.0000	35.0000	102.0000
	MIN	52.0000	128.0000	33.0000	11.0000	11.0000	10.0000	34.0000
	MEAN	141.1211	177.0000	54.2500	51.8687	41.8555	22.5000	68.0600
	STD.DEV	86.5486	40.8733	22.9705	29.4061	25.2905	7.2702	48.0831
00410 ALKALINITY	NO.POTW	6.0000	4.0000	10.0000	13.0000	10.0000	15.0000	4.0000
PH 4.5 MG/L	MAX	300.0000	258.0000	319.0000	344.0000	400.0000	384.0000	317.0000
	MIN	83.0000	18.5000	133.0000	41.0000	117.0000	78.0000	135.0000
	MEAN	186.5000	134.8750	203.3500	162.2308	244.6000	238.2000	264.0000
	STD.DEV	79.1495	99.7165	63.8173	104.3830	107.7918	80.6967	86.4283
00400 PH	NO.POTW	54.0000	8.0000	36.0000	33.0000	36.0000	24.0000	9.0000
SU	MAX	8.2000	7.9000	7.9000	8.0000	8.0000	8.3000	7.9000
	MIN	5.0000	5.6000	6.6000	4.0000	6.2000	6.3000	7.0000
	MEAN	7.0539	6.9125	7.2822	7.0836	7.1997	7.2937	7.4778
	STD.DEV	0.4973	0.7434	0.3627	0.7608	0.4258	0.4908	0.3031
00095 SPECIFIC	NO.POTW	3.0000	3.0000	10.0000	7.0000	8.0000	18.0000	3.0000
CONDUCTANCE MICROMHO	MAX	970.0000	600.0000	1475.0000	4400.0000	1900.0000	3170.0000	2500.0000
	MIN	615.0000	500.0000	634.0000	669.0000	791.0000	760.0000	1820.0000
	MEAN	828.3333	550.0000	942.5000	1455.5713	1208.0000	1446.9443	2106.6665
	STD.DEV	188.0360	49.9959	314.5103	1328.3367	382.5190	672.5767	352.3655
01105 TOT ALUMINUM	NO.POTW	1.0000	0.0	4.0000	2.0000	3.0000	9.0000	3.0000
AL UG/L	MAX	410.0000	0.0	1450.0000	100.0000	200.0000	570.0000	200.0000
	MIN	410.0000	0.0	100.0000	20.0000	100.0000	100.0000	100.0000
	MEAN	410.0000	0.0	735.0000	60.0000	166.6667	211.1111	133.3333
	STD.DEV	0.0000	0.0	553.0823	56.5685	57.7348	148.5298	57.7349
01045 TOT IRON	NO.POTW	23.0000	8.0000	18.0000	17.0000	20.0000	21.0000	8.0000
FE UG/L	MAX	3500.0000	5000.0000	10000.0000	65550.0000	6800.0000	1550.0000	1100.0000
	MIN	400.0000	620.0000	100.0000	110.0000	100.0000	100.0000	35.0000
	MEAN	1344.3042	2083.7500	1331.7222	4572.0586	941.0498	482.2856	267.3750
	STD.DEV	847.8044	1287.4473	2225.0439	15725.2813	1527.0234	424.9780	349.1960
01055 TOT MANGANESE	NO.POTW	16.0000	6.0000	12.0000	17.0000	7.0000	18.0000	6.0000
MN UG/L	MAX	362.0000	390.0000	329.0000	580.0000	443.0000	940.0000	138.0000
	MIN	30.0000	66.0000	40.0000	20.0000	20.0000	10.0000	12.0000
	MEAN	147.9375	250.3333	120.5833	148.8235	141.2857	147.4444	51.5000
	STD.DEV	102.7452	107.4531	89.0601	150.6980	143.2210	212.7679	46.2504
50060 CHLORINE,	NO.POTW	26.0000	2.0000	8.0000	12.0000	10.0000	13.0000	3.0000
TOT RESIDUAL MG/L	MAX	10.0000	3.0000	3.0000	3.0000	3.0000	3.0000	1.1000
	MIN	0.2000	0.1000	0.1000	0.1000	0.6000	0.0700	0.2500
	MEAN	1.9558	1.5500	1.8775	2.0558	1.5090	1.1385	0.6500
	STD.DEV	1.9374	2.0506	1.1025	0.8526	0.7272	0.8896	0.4272

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                                                          POTW EFFLUENT DATA ANALYSIS                 PAGE  5         5/23/75
REPORT NO.7
                                                                                                       
IPARAMETERS           CATEGORY      A1          OTHER A         B1        OTHER B         C1        OTHER C       MISC(D,J)
V                     -------->
00720      CYANIDE,     NO.POTW     2.0000       3.0000        5.0000      3.0000      10.0000      12.0000       5.0000
TOTAL           MG/L      MAX       0.1700       0.0600        0.0160    100.0000       0.1060       2.2600       0.0300
                          MIN       0.0200       0.0100        0.0030      0.0030       0.0020       0.0050       0.0050
                         MEAN       0.0950       0.0400        0.0082     33.3373       0.0275       0.2101       0.0138
                      STD.DEV       0.1061       0.0265        0.0051     57.7316       0.0364       0.6466       0.0122

38260      MBAS         NO.POTW     4.0000       2.0000        5.0000      4.0000       6.0000       3.0000       1.0000
                MG/L      MAX      17.8000       3.8000        3.2800      2.6800       3.2900       1.7000       0.2900
                          MIN       0.4250       1.0000        0.5700      0.6200       0.2000       0.2100       0.2900
                         MEAN       7.3087       2.4000        1.8020      1.6075       1.2283       0.7700       0.2900
                      STD.DEV       7.3937       1.9799        1.0141      0.9892       1.2468       0.8110       0.0000

00620      NITROGEN,    NO.POTW    38.0000       4.0000       15.0000     18.0000      22.0000       8.0000       1.0000
NITRATE         MG/L      MAX       6.5000       2.1000        8.6000     11.3800       8.0000       7.9900       2.2000
                          MIN       0.0100       0.4000        0.1200      0.1400       0.0500       0.0200       2.2000
                         MEAN       1.0715       1.0000        2.0527      2.2539       1.9377       1.6450       2.2000
                      STD.DEV       1.1878       0.7517        2.4417      2.7327       2.2021       2.6992       0.0000

01032      HEXAVALENT   NO.POTW     3.0000       0.0           5.0000      2.0000       4.0000      11.0000       3.0000
CHROMIUM,  UG/L AS CR     MAX      25.0000       0.0          20.0000    100.0000      16.0000      60.0000      10.0000
                          MIN       5.0000       0.0           2.0000     10.0000      10.0000      10.0000       2.0000
                         MEAN      16.6667       0.0          10.6000     55.0000      11.5000      18.6364       7.3333
                      STD.DEV      10.4084       0.0           7.4699     63.6396       3.0000      16.7467       4.6188

00615      NITROGEN,    NO.POTW    37.0000       5.0000       14.0000     19.0000      16.0000       8.0000       1.0000
NITRITE         MG/L      MAX       0.6900       0.2300        0.2940      2.0000       0.6000       8.2450       0.1300
                          MIN       0.0240       0.0130        0.0040      0.0100       0.0170       0.0100       0.1300
                         MEAN       0.1649       0.1406        0.1601      0.3411       0.1404       1.2786       0.1300
                      STD.DEV       0.1255       0.0837        0.0984      0.5201       0.1371       2.8546       0.0000

00605      NITROGEN,    NO.POTW    12.0000       0.0           6.0000      3.0000      13.0000       3.0000       0.0
ORGANIC         MG/L      MAX      22.0000       0.0          11.8000     15.0000      24.5000      15.1000       0.0
                          MIN       4.0000       0.0           3.0000      4.4000       0.4000       2.7000       0.0
                         MEAN      10.8833       0.0           6.9833      8.0000       5.0308       7.1000       0.0
                      STD.DEV       6.5013       0.0           3.7107      6.0630       6.3547       6.9397       0.0

00666      DISSOLVED    NO.POTW     2.0000       0.0           2.0000      2.0000       5.0000       3.0000       0.0
PHOSPHORUS      MG/L      MAX       5.4000       0.0           3.2000      8.4000       8.0000       4.8000       0.0
                          MIN       4.3000       0.0           2.3000      4.0000       3.0000       1.8000       0.0
                         MEAN       4.8500       0.0           2.7500      6.2000       4.6600       3.2000       0.0
                      STD.DEV       0.7778       0.0           0.5364      3.1113       1.9308       1.5100       0.0

[redacted]  [redacted]  NO.POTW    [illegible]   1.0000        6.0000      4.0000       9.0000       1.0000       0.0
                          MAX      11.7000       0.6900        0.1300      0.1300       1.4000       0.0300       0.0
                          MIN       0.0600       0.6900        0.0300      0.0400       0.0100       0.0300       0.0
                         MEAN       0.5005       0.6900        0.0733      0.0725       0.2522       0.0300       0.0
                      STD.DEV       2.0460       0.0000        0.0476      0.0395       0.4678       0.0000       0.0
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IPARAMETERS              CATEGORY      A1          OTHER A          B1          OTHER B          C1         OTHER C         MISC(D,J)
V                        ------->
01090       ZINC,         NO.POTW      26.0000       1.0000        4.0000        3.0000        8.0000        1.0000          0.0
DISSOLVED MG/L AS ZN        MAX         3.2500       0.5900        0.0700        0.1000        1.1600        0.0800          0.0
                            MIN         0.0400       0.5900        0.0600        0.0500        0.0100        0.0800          0.0
                            MEAN        0.3941       0.5900        0.0650        0.0700        0.2912        0.0800          0.0
                          STD.DEV       0.6701       0.0000        0.0058        0.0265        0.4621        0.0000          0.0

01030       CHROMIUM,     NO.POTW      31.0000       1.0000        6.0000        4.0000        9.0000        1.0000          0.0
DISSOLVED MG/L AS CR        MAX         0.5600       0.0700        0.0100        0.0100        0.7000        0.0100          0.0
                            MIN         0.0100       0.0700        0.0100        0.0100        0.0100        0.0100          0.0
                            MEAN        0.0723       0.0700        0.0100        0.0100        0.1233        0.0100          0.0
                          STD.DEV       0.1197       0.0000        0.0000        0.0           0.2284        0.0000          0.0

01049       LEAD,         NO.POTW      31.0000       1.0000        6.0000        4.0000        9.0000        1.0000          0.0
DISSOLVED MG/L AS PB        MAX         0.2000       0.3000        0.1000        0.1000        0.1000        0.1000          0.0
                            MIN         0.1000       0.3000        0.0200        0.1000        0.1000        0.1000          0.0
                            MEAN        0.1097       0.3000        0.0867        0.1000        0.1000        0.1000          0.0
                          STD.DEV       0.0301       0.0000        0.0327        0.0001        0.0           0.0000          0.0

01065       NICKEL,       NO.POTW      31.0000       1.0000        6.0000        4.0000        9.0000        1.0000          0.0
DISSOLVED MG/L AS NI        MAX         0.8200       0.1000        0.1000        0.1000        0.8000        0.1000          0.0
                            MIN         0.1000       0.1000        0.1000        0.1000        0.1000        0.1000          0.0
                            MEAN        0.1313       0.1000        0.1000        0.1000        0.1944        0.1000          0.0
                          STD.DEV       0.1330       0.0000        0.0001        0.0001        0.2324        0.0000          0.0

01025       CADMIUM,      NO.POTW      31.0000       1.0000        6.0000        4.0000        9.0000        1.0000          0.0
DISSOLVED MG/L AS CD        MAX         0.0300       0.0200        0.0100        0.0100        0.1200        0.0100          0.0
                            MIN         0.0100       0.0200        0.0100        0.0100        0.0100        0.0100          0.0
                            MEAN        0.0124       0.0200        0.0100        0.0100        0.0222        0.0100          0.0
                          STD.DEV       0.0062       0.0000        0.0000        0.0           0.0367        0.0000          0.0

01056       MANGANESE,    NO.POTW      31.0000       1.0000        6.0000        4.0000        9.0000        1.0000          0.0
DISSOLVED MG/L AS MN        MAX         0.3600       0.2400        0.1100        0.1100        0.2600        0.0200          0.0
                            MIN         0.0005       0.2400        0.0300        0.0600        0.0200        0.0200          0.0
                            MEAN        0.1578       0.2400        0.0667        0.0850        0.1244        0.0200          0.0
                          STD.DEV       0.0796       0.0000        0.0301        0.0238        0.0838        0.0000          0.0

71890       MERCURY,      NO.POTW      25.0000       1.0000        4.0000        4.0000        8.0000        1.0000          0.0
DISSOLVED MG/L AS HG        MAX         0.0017       0.0023        0.0009        0.0018        0.0008        0.0010          0.0
                            MIN         0.0001       0.0023        0.0001        0.0003        0.0001        0.0010          0.0
                            MEAN        0.0005       0.0023        0.0006        0.0008        0.0005        0.0010          0.0
                          STD.DEV       0.0004       0.0000        0.0003        0.0007        0.0002        0.0000          0.0

70507       TOT ORTHO-    NO.POTW      33.0000       2.0000        7.0000       13.0000        9.0000        4.0000          0.0
PHOSPHATE        MG/L       MAX         7.7000       8.0000        3.6000       13.0000       28.0000       18.0000          0.0
                            MIN         0.7000       3.7000        0.7000        1.7500        1.0000        0.1000          0.0
                            MEAN        3.2524       5.8500        2.5143        6.7808        4.6778        7.6750          0.0
                          STD.DEV       1.6278       3.0405        0.9907        3.9475        8.7695        8.0653          0.0

00690       TOT CARBON    NO.POTW      28.0000       2.0000        5.0000        5.0000        5.0000        1.0000          0.0
            MG/L AS C       MAX       580.0000     252.0000      111.0000      160.0000       90.0000       24.0000          0.0
                            MIN        88.0000     225.0000       50.0000       52.0000       40.0000       24.0000          0.0
                            MEAN      180.6964     238.5000       76.8000       86.2000       62.8000       24.0000          0.0
                          STD.DEV      95.0198      19.0903       28.5778       43.8315       17.9218        0.0000          0.0
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REPORT NO.7                                            POTW EFFLUENT DATA ANALYSIS                    PAGE  7              5/23/75
IPARAMETERS            CATEGORY        A1         OTHER A          B1        OTHER B          C1       OTHER C          MISC(D,J)
V                      ------->
00900      HARDNESS,   NO.POTW      13.0000       1.0000        5.0000       1.0000        6.0000       0.0             0.0
TOTAL           MG/L     MAX       330.0000     154.0000      110.0000      44.0000      632.0000       0.0             0.0
                         MIN        30.0000     154.0000       32.0000      44.0000       60.0000       0.0             0.0
                         MEAN      100.0000     154.0000       88.0000      44.0000      191.3333       0.0             0.0
                       STD.DEV      77.8759       0.0000       32.1558       0.0000      221.4921       0.0             0.0

00425      ALKALINITY  NO.POTW      11.0000       0.0           4.0000       0.0           4.0000       0.0             0.0
-BICARBONATE    MG/L     MAX       300.0000       0.0         160.0000       0.0         104.0000       0.0             0.0
                         MIN        74.0000       0.0         102.0000       0.0          22.0000       0.0             0.0
                         MEAN      155.0000       0.0         122.0000       0.0          62.0000       0.0             0.0
                       STD.DEV      74.6978       0.0          25.8714       0.0          42.9884       0.0             0.0

00650      TOTAL       NO.POTW      15.0000       1.0000        9.0000      12.0000        8.0000       4.0000          0.0
PHOSPHATE       MG/L     MAX        68.0000      24.5000       36.5000      26.0000       90.0000      28.2500          0.0
                         MIN        15.5000      24.5000       11.5000       1.5600       14.0000       1.1000          0.0
                         MEAN       31.4533      24.5000       24.5500      11.8117       30.3237      14.3375          0.0
                       STD.DEV      13.1506       0.0000        9.5018       7.2740       25.1594      11.6836          0.0

00070      TURBIDITY   NO.POTW       4.0000       4.0000        7.0000       5.0000        6.0000       3.0000          1.0000
                 JTU     MAX        68.0000      76.5000       40.0000      99.0000       54.0000      29.3000          5.0000
                         MIN        25.0000      26.0000       15.0000      21.0000        3.0000      20.0000          5.0000
                         MEAN       48.7500      49.8750       27.9000      43.8000       24.0167      25.1000          5.0000
                       STD.DEV      17.7645      21.3477        9.6126      31.4436       16.9215       4.7149          0.0000

00671      DISSOLVED   NO.POTW       3.0000       0.0           3.0000       1.0000        3.0000       3.0             0.0
ORTHOPHOSPHATE  MG/L     MAX        40.0000       0.0           6.7500      15.0000        3.0000       0.0             0.0
                         MIN         1.4000       0.0           4.2000      15.0000        0.1600       0.0             0.0
                         MEAN       14.9667       0.0           5.1500      15.0000        1.4533       0.0             0.0
                       STD.DEV      21.7049       0.0           1.3937       0.0000        1.4368       0.0             0.0

01037      COBALT,TOT  NO.POTW       0.0          2.0000        0.0           0.0           0.0          2.0000          1.0000
           UG/L AS CO    MAX         0.0         30.0000        0.0           0.0           0.0         20.0000         20.0000
                         MIN         0.0         20.0000        0.0           0.0           0.0         20.0000         20.0000
                         MEAN        0.0         25.0000        0.0           0.0           0.0         20.0000         20.0000
                       STD.DEV       0.0          7.0711        0.0           0.0           0.0          0.0271          0.0000

01007      BARIUM,TOT  NO.POTW       1.0000       0.0           0.0           1.0000        0.0          1.0000          0.0
           UG/L AS BA    MAX       160.0000       0.0           0.0         100.0000        0.0       5800.0000          0.0
                         MIN       160.0000       0.0           0.0         100.0000        0.0       5800.0000          0.0
                         MEAN      160.0000       0.0           0.0         100.0000        0.0       5800.0000          0.0
                       STD.DEV       0.0000       0.0           0.0           0.0000        0.0          0.0000          0.0

00076      TURBIDITY   NO.POTW       1.0000       0.0           1.0000        1.0000        0.0          1.0000          0.0
                 FTU     MAX        57.0000       0.0          10.0000       25.0000        0.0          6.0000          0.0
                         MIN        57.0000       0.0          10.0000       25.0000        0.0          6.0000          0.0
                         MEAN       57.0000       0.0          10.0000       25.0000        0.0          6.0000          0.0
                       STD.DEV       0.0000       0.0           0.0000        0.0000        0.0          0.0000          0.0
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SUMMARY OF POTW EFFLUENT DATA

/PARAMETERS V		CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
00550	OIL-GREASE	NO.POTW	6.0000	11.0000	8.0000	19.0000	1.0000	29.0000
TOT-SXLT	MG/L	MAX	44.0000	72.0000	130.0000	130.0000	9.4000	130.0000
		MIN	19.0000	4.0000	5.0000	4.0000	9.4000	1.0000
		MEAN	27.8333	21.1091	32.9250	26.0842	9.4000	26.0414
		STD.DEV	9.3310	20.0922	41.8917	30.7029	0.0000	26.4917
00556	OIL-GREASE	NO.POTW	0.0	3.0000	3.0000	6.0000	2.0000	8.0000
SEP-FUNNEL	MG/L	MAX	0.0	9.0000	8.0000	9.0000	5.0000	9.0000
		MIN	0.0	1.0000	5.0000	1.0000	1.0000	1.0000
		MEAN	0.0	4.1667	6.0000	5.0833	3.0000	4.5625
		STD.DEV	0.0	4.2525	1.7321	3.0727	2.8284	2.9693
00560	OIL-GREASE	NO.POTW	0.0	0.0	0.0	0.0	0.0	0.0
INFRARED	MG/L	MAX	0.0	0.0	0.0	0.0	0.0	0.0
		MIN	0.0	0.0	0.0	0.0	0.0	0.0
		MEAN	0.0	0.0	0.0	0.0	0.0	0.0
		STD.DEV	0.0	0.0	0.0	0.0	0.0	0.0
00500	RESIDUE	NO.POTW	30.0000	45.0000	33.0000	78.0000	9.0000	119.0000
TOTAL, TS	MG/L	MAX	1842.0000	2034.0000	3440.0000	3440.0000	727.0000	3440.0000
		MIN	346.0000	40.0000	294.0000	40.0000	312.0000	40.0000
		MEAN	688.8665	628.6487	712.2119	664.0024	548.7776	692.3796
		STD.DEV	362.0049	389.8845	578.5815	477.1821	158.4633	495.3723
00530	RESIDUE	NO.POTW	54.0000	66.0000	64.0000	130.0000	31.0000	210.0000
TOT NFLT, SS	MG/L	MAX	314.0000	228.0000	185.0000	228.0000	30.0000	314.0000
		MIN	15.0000	5.0000	2.0000	2.0000	2.0000	2.0000
		MEAN	93.2722	42.6500	37.1250	39.9300	11.1935	53.4518
		STD.DEV	62.4438	37.0209	39.7279	38.3284	7.1759	52.1177
00310	BOD	NO.POTW	58.0000	62.0000	65.0000	127.0000	31.0000	209.0000
5DAY	MG/L	MAX	650.0000	245.0000	230.0000	245.0000	28.0000	650.0000
		MIN	20.0000	4.0000	2.0000	2.0000	2.0000	2.0000
		MEAN	166.7810	48.5710	28.2861	38.1889	10.5355	74.6075
		STD.DEV	110.4911	47.2754	40.7063	45.0249	7.4303	92.2027
00340	COD	NO.POTW	16.0000	28.0000	27.0000	55.0000	15.0000	86.0000
HI LEVEL	MG/L	MAX	768.0000	361.0000	275.0000	361.0000	231.0000	768.0000
		MIN	58.0000	26.0000	31.7000	26.0000	26.0000	14.3000
		MEAN	334.8125	138.8036	98.3518	118.9454	65.7333	158.6546
		STD.DEV	222.3276	80.2413	65.3504	75.4455	52.3604	147.1832
00335	COD	NO.POTW	1.0000	1.0000	5.0000	6.0000	4.0000	9.0000
LOW LEVEL	MG/L	MAX	345.0000	66.0000	51.0000	66.0000	27.0000	345.0000
		MIN	345.0000	66.0000	14.0000	14.0000	14.0000	14.0000
		MEAN	345.0000	66.0000	27.8000	34.1667	22.0000	74.2222
		STD.DEV	0.0000	0.0000	13.8456	19.9139	5.5976	104.4721

NOTES:

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4) ACTIVATED SLUDGE (C) INCLUDES C01,C02,C05,C06,C09,C19,C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L
   AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

REPORT NO.8 SUMMARY OF POTW EFFLUENT DATA 5/23/75

/PARAMETERS ▼		CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
00342	SEA COD	NO.POTW	2.0000	9.0000	10.0000	19.0000	3.0000	24.0000
SALINE	MG/L	MAX	514.0000	315.0000	173.0000	315.0000	51.0000	514.0000
		MIN	345.0000	18.0000	16.0000	16.0000	25.0000	16.0000
		MEAN	429.5000	122.7778	83.2080	101.9474	42.3333	123.7083
		STD.DEV	119.5015	87.4153	57.7828	74.0122	15.0112	119.1603
32730	PHENOLICS	NO.POTW	7.0000	15.0000	18.0000	33.0000	7.0000	49.0000
4AAP DISTIL	UG/L	MAX	53.0000	3000.0000	2000.0000	3000.0000	10.0000	30000.0000
		MIN	0.1000	0.0300	0.0200	0.0200	2.0000	0.0200
		MEAN	16.2928	208.8579	134.6238	168.3663	4.5971	729.1465
		STD.DEV	23.0982	772.2639	472.7380	617.2905	3.4961	4298.9219
00945	SULFATE	NO.POTW	19.0000	17.0000	25.0000	42.0000	7.0000	70.0000
	MG/L	MAX	150.0000	454.0000	223.0000	454.0000	176.0000	470.0000
		MIN	26.0000	22.0000	33.0000	22.0000	44.0000	17.0000
		MEAN	69.1053	94.8823	99.6400	97.7143	110.5714	106.6286
		STD.DEV	36.4370	106.4648	57.9913	79.9841	51.6584	98.8269
00940	CHLORIDE	NO.POTW	41.0000	33.0000	34.0000	67.0000	14.0000	123.0000
CL	MG/L	MAX	2169.0000	488.0000	1561.0000	1561.0000	420.0000	2169.0000
		MIN	43.0000	32.0000	43.0000	32.0000	43.0000	32.0000
		MEAN	296.8584	115.0151	245.9382	181.4536	148.7143	227.6714
		STD.DEV	421.0542	100.3362	288.7170	225.6298	95.2359	309.8406
00665	TOTAL	NO.POTW	10.0000	27.0000	40.0000	67.0000	19.0000	95.0000
PHOSPHORUS	MG/L	MAX	77.0000	18.3000	10.4000	18.3000	10.3000	77.0000
		MIN	1.3400	3.2700	1.0000	1.0000	1.0000	0.4600
		MEAN	12.9470	9.0196	5.2462	6.7668	5.0300	7.0187
		STD.DEV	22.6614	3.8269	2.7136	3.6876	2.9706	8.2370
00630	NITROGEN,	NO.POTW	2.0000	20.0000	21.0000	41.0000	11.0000	56.0000
NO2-NO3	MG/L	MAX	10.0000	16.0000	19.9000	19.9000	19.9000	23.8000
		MIN	0.0300	0.0260	0.0200	0.0200	0.0800	0.0100
		MEAN	5.0150	5.5005	4.3681	4.9205	9.3600	4.9501
		STD.DEV	7.0499	4.7009	5.9565	5.3446	6.0649	5.7187
00610	NITROGEN,	NO.POTW	64.0000	66.0000	64.0000	130.0000	29.0000	218.0000
AMMONIA	MG/L	MAX	256.5999	115.0000	27.5000	115.0000	76.0000	256.5999
		MIN	2.1000	0.0300	0.0700	0.0300	0.0300	0.0300
		MEAN	20.2024	16.6120	11.0571	13.8773	9.0310	15.0710
		STD.DEV	34.6453	17.2788	7.5512	13.6351	14.4904	21.9995
00625	NITROGEN,	NO.POTW	8.0000	22.0000	12.0000	34.0000	3.0000	51.0000
KJELDAHL,	TOTAL MG/L	MAX	47.0000	46.7500	34.0000	46.7500	14.0000	47.0000
		MIN	8.5000	1.2000	1.5000	1.2000	1.5000	1.2000
		MEAN	24.3750	16.0109	10.9650	17.5714	6.7333	16.8844
		STD.DEV	11.6458	11.8857	9.6287	11.0270	6.4933	11.5900

NOTES:
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3) TRICKLING FILTER (B) INCLUDES B01,B02,B04,B05
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5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

SUMMARY OF POTW EFFLUENT DATA

/PARAMETERS V	CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01002 TOT ARSENIC	NO.POTW	1.0000	4.0000	5.0000	9.0000	2.0000	14.0000
AS UG/L	MAX	2.0000	20.0000	5.0000	20.0000	5.0000	20.0000
	MIN	2.0000	0.5000	2.0000	0.5000	2.0000	0.5000
	MEAN	2.0000	6.8250	3.2000	4.8111	3.5000	4.6643
	STD.DEV	0.0000	8.9623	1.6432	5.9263	2.1213	4.8573
01027 TOT CADMIUM	NO.POTW	36.0000	43.0000	50.0000	93.0000	16.0000	145.0000
CD UG/L	MAX	40.0000	66.0000	1970.0000	1970.0000	1970.0000	1970.0000
	MIN	3.0000	1.0000	1.0000	1.0000	2.0000	1.0000
	MEAN	14.0833	11.2395	50.1280	32.1430	131.5000	28.2965
	STD.DEV	8.9805	10.4963	277.1191	203.3024	490.2800	167.1832
01034 TOT CHROMIUM	NO.POTW	43.0000	56.0000	61.0000	117.0000	21.0000	179.0000
CR UG/L	MAX	2600.0000	3200.0000	2520.0000	3200.0000	200.0000	3200.0000
	MIN	6.0000	3.0000	5.0000	3.0000	5.0000	3.0000
	MEAN	188.3488	235.3929	201.9295	217.9461	33.5714	197.6112
	STD.DEV	405.9954	563.0363	515.0706	536.4790	46.9430	480.8142
01051 TOT LEAD	NO.POTW	37.0000	47.0000	52.0000	99.0000	20.0000	157.0000
PB UG/L	MAX	1700.0000	1800.0000	350.0000	1800.0000	270.0000	1800.0000
	MIN	10.0000	5.0000	3.0000	3.0000	10.0000	3.0000
	MEAN	156.0270	116.0213	67.3788	90.4717	57.4000	105.7707
	STD.DEV	272.0637	276.3105	67.6438	197.0117	57.2751	221.7903
71900 TOT MERCURY	NO.POTW	23.0000	24.0000	38.0000	62.0000	16.0000	97.0000
HG UG/L	MAX	5.0000	10.0000	200.0000	200.0000	200.0000	200.0000
	MIN	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
	MEAN	0.9826	0.9620	5.9771	4.0358	12.9706	2.9053
	STD.DEV	1.3193	1.9679	32.3372	25.3338	49.8766	20.2664
01042 TOT COPPER	NO.POTW	48.0000	56.0000	70.0000	126.0000	25.0000	192.0000
CU UG/L	MAX	1700.0000	1800.0000	1600.0000	1800.0000	120.0000	1800.0000
	MIN	10.0000	2.6000	8.0000	2.6000	8.0000	2.6000
	MEAN	191.0833	132.6092	91.7571	109.9492	38.5600	125.6505
	STD.DEV	278.2058	283.0786	195.1586	238.1161	31.3808	242.1976
01097 TOT ANTIMONY	NO.POTW	0.0	0.0	0.0	0.0	0.0	1.0000
UG/L	MAX	0.0	0.0	0.0	0.0	0.0	5.0000
	MIN	0.0	0.0	0.0	0.0	0.0	5.0000
	MEAN	0.0	0.0	0.0	0.0	0.0	5.0000
	STD.DEV	0.0	0.0	0.0	0.0	0.0	0.0000
01067 TOT NICKEL	NO.POTW	33.0000	40.0000	58.0000	98.0000	22.0000	149.0000
NI UG/L	MAX	1700.0000	1533.0000	40000.0000	40000.0000	370.0000	40000.0000
	MIN	6.0000	7.0000	3.0000	3.0000	7.0000	3.0000
	MEAN	164.5757	150.0425	786.7515	546.4622	69.8182	410.7668
	STD.DEV	307.1809	335.0806	5244.5742	4036.4604	74.8423	3278.7412

NOTES:
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4) ACTIVATED SLUDGE (C) INCLUDES C01.C02.C05.C06.C09.C19.C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L
AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

/PARAMETERS V	CATEGORY	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01147 TOT SELENIUM	NO.POTW	0.0	0.0	2.0000	2.0000	1.0000	5.0000
UG/L	MAX	0.0	0.0	2.0000	2.0000	2.0000	5.0000
	MIN	0.0	0.0	2.0000	2.0000	2.0000	2.0000
	MEAN	0.0	0.0	2.0000	2.0000	2.0000	3.0000
	STD.DEV	0.0	0.0	0.0	0.0	0.0000	1.6432
01077 TOT SILVER	NO.POTW	1.0000	2.0000	0.0	2.0000	0.0	5.0000
AG UG/L	MAX	13.0000	445.7000	0.0	445.7000	0.0	445.7000
	MIN	13.0000	2.0000	0.0	2.0000	0.0	2.0000
	MEAN	13.0000	223.8500	0.0	223.8500	0.0	96.1400
	STD.DEV	0.0000	313.7434	0.0	313.7429	0.0	195.4525
01092 TOT ZINC	NO.POTW	49.0000	60.0000	69.0000	129.0000	22.0000	198.0000
ZN UG/L	MAX	3600.0000	2800.0000	1400.0000	2800.0000	650.0000	3600.0000
	MIN	30.0000	40.0000	10.0000	10.0000	10.0000	9.0000
	MEAN	550.0610	316.1665	237.6420	274.1650	172.3182	330.4575
	STD.DEV	657.9351	463.5981	257.2742	368.4727	181.4486	463.8679
01102 TOT TIN	NO.POTW	0.0	0.0	3.0000	3.0000	0.0	6.0000
UG/L	MAX	0.0	0.0	12600.0000	12600.0000	0.0	12600.0000
	MIN	0.0	0.0	400.0000	400.0000	0.0	400.0000
	MEAN	0.0	0.0	4466.6641	4466.6641	0.0	2433.3333
	STD.DEV	0.0	0.0	7043.6797	7043.6797	0.0	4980.6016
00680 TOT ORG CARBON	NO.POTW	35.0000	23.0000	14.0000	37.0000	8.0000	82.0000
TOTAL,TOC MG/L	MAX	539.0000	129.0000	95.0000	129.0000	74.0000	539.0000
	MIN	52.0000	23.0000	10.0000	10.0000	10.0000	10.0000
	MEAN	141.7999	54.3000	35.3357	47.1243	29.1250	92.0974
	STD.DEV	84.2303	26.2976	22.4007	26.2822	20.9586	78.0403
00410 ALKALINITY	NO.POTW	9.0000	22.0000	22.0000	44.0000	8.0000	64.0000
PH 4.5 MG/L	MAX	300.0000	344.0000	400.0000	400.0000	400.0000	400.0000
	MIN	18.5000	41.0000	78.0000	41.0000	184.0000	18.5000
	MEAN	167.0555	180.1136	248.0909	214.1023	269.6250	204.7500
	STD.DEV	91.8010	91.7973	93.7499	97.9259	71.1415	94.5882
00400 PH	NO.POTW	59.0000	67.0000	54.0000	121.0000	26.0000	203.0600
SU	MAX	8.2000	8.0000	8.3000	8.3000	8.3000	9.0000
	MIN	5.0000	4.0000	6.2000	4.0000	6.7000	4.0000
	MEAN	7.0764	7.1659	7.2146	7.1876	7.3461	7.1860
	STD.DEV	0.4998	0.5876	0.4684	0.5326	0.3989	0.5534
00095 SPECIFIC	NO.POTW	5.0000	15.0000	20.0000	35.0000	9.0000	53.0000
CONDUCTANCE MICROMHO	MAX	970.0000	1480.0000	2780.0000	2780.0000	2170.0000	4400.0000
	MIN	550.0000	634.0000	760.0000	634.0000	634.0000	500.0000
	MEAN	727.0000	952.2666	1369.3999	1190.6284	1184.1111	1261.0942
	STD.DEV	192.9903	312.1035	518.5095	483.9617	503.4524	716.6147

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SUMMARY OF POTW EFFLUENT DATA

REPORT NO.8

/PARAMETERS V	CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01105 TOT ALUMINUM	NO.POTW	1.0000	6.0000	11.0000	17.0000	5.0000	23.0000
AL UG/L	MAX	410.0000	1450.0000	570.0000	1450.0000	200.0000	1450.0000
	MIN	410.0000	20.0000	100.0000	20.0000	100.0000	20.0000
	MEAN	410.0000	510.0000	193.6364	305.2939	160.0000	281.3042
	STD.DEV	0.0000	552.8840	135.0016	362.2170	54.7717	316.5637
01045 TOT IRON	NO.POTW	30.0000	35.0000	37.0000	72.0000	17.0000	117.0000
FE UG/L	MAX	5000.0000	65550.0000	6800.0000	65550.0000	1000.0000	65550.0000
	MIN	400.0000	100.0000	100.0000	100.0000	100.0000	35.0000
	MEAN	1517.6333	2905.5999	746.7837	1796.2083	298.8235	1600.8801
	STD.DEV	1023.4553	11024.6836	1171.4160	7751.0938	223.4851	6121.0117
01055 TOT MANGANESE	NO.POTW	22.0000	28.0000	23.0000	51.0000	11.0000	84.0000
MN UG/L	MAX	390.0000	580.0000	940.0000	940.0000	190.0000	940.0000
	MIN	30.0000	20.0000	10.0000	10.0000	10.0000	10.0000
	MEAN	175.8636	136.3214	144.2174	139.8823	82.3636	146.5357
	STD.DEV	111.6616	129.9118	200.4855	163.7516	56.4114	145.4156
50060 CHLORINE,	NO.POTW	26.0000	20.0000	22.0000	42.0000	14.0000	74.0000
TOT RESIDUAL MG/L	MAX	10.0000	3.0000	3.0000	3.0000	3.0000	10.0000
	MIN	0.2000	0.1000	0.2000	0.1000	0.7200	0.0700
	MEAN	1.9558	1.9845	1.3555	1.6550	1.8693	1.6957
	STD.DEV	1.9374	0.9363	0.8003	0.9140	0.8210	1.3871
00720 CYANIDE,	NO.POTW	4.0000	8.0000	20.0000	28.0000	10.0000	41.0000
TOTAL MG/L	MAX	0.1700	100.0000	2.2600	100.0000	0.1400	100.0000
	MIN	0.0200	0.0030	0.0020	0.0020	0.0020	0.0020
	MEAN	0.0750	12.5066	0.1380	3.6719	0.0319	2.5179
	STD.DEV	0.0656	35.3526	0.5089	18.8833	0.0447	15.6087
38260 MBAS	NO.POTW	6.0000	9.0000	8.0000	17.0000	2.0000	25.0000
MG/L	MAX	17.8000	3.2800	3.2900	3.2900	0.2200	17.8000
	MIN	0.4250	0.5700	0.2000	0.2000	0.2000	0.2000
	MEAN	5.6725	1.7156	1.1600	1.4541	0.2100	2.3778
	STD.DEV	6.3253	0.9443	1.1336	1.0439	0.0141	3.5671
00620 NITROGEN,	NO.POTW	40.0000	33.0000	30.0000	63.0000	10.0000	106.0000
NITRATE MG/L	MAX	6.5000	11.3800	8.0000	11.3800	6.7400	11.3800
	MIN	0.0100	0.1200	0.0200	0.0200	0.0500	0.0100
	MEAN	1.0554	2.1570	1.8597	2.0154	2.0110	1.6404
	STD.DEV	1.1591	2.5461	2.2995	2.4278	2.2987	2.0528

NOTES:
1) NEGATIVE REMOVALS DELETED
2) PRIMARY (A) INCLUDES A01,A02
3) TRICKLING FILTER (B) INCLUDES B01,B02,B04,B05
4) ACTIVATED SLUDGE (C) INCLUDES C01,C02,C05,C06,C09,C19,C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L
   AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

/PARAMETERS V	CATEGORY -------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01032 HEXAVALENT CHROMIUM, UG/L AS CR	NO.POTW	3.0000	6.0000	14.0000	20.0000	6.0000	29.0000
	MAX	25.0000	20.0000	60.0000	60.0000	60.0000	100.0000
	MIN	5.0000	2.0000	10.0000	2.0000	10.0000	2.0000
	MEAN	16.6667	10.5000	17.2143	15.2000	18.3333	17.1034
	STD.DEV	10.4084	6.6858	15.0189	13.2688	20.4124	19.7634
00615 NITROGEN, NITRITE MG/L	NO.POTW	40.0000	33.0000	24.0000	57.0000	7.0000	100.0000
	MAX	0.6900	2.0000	8.2450	8.2450	2.0000	8.2450
	MIN	0.0130	0.0040	0.0100	0.0040	0.0600	0.0040
	MEAN	0.1636	0.2643	0.5198	0.3719	0.4421	0.2813
	STD.DEV	0.1236	0.4083	1.6712	1.1212	0.7126	0.8533
00605 NITROGEN, ORGANIC MG/L	NO.POTW	12.0000	8.0000	16.0000	24.0000	5.0000	37.0000
	MAX	22.0000	11.8000	24.5000	24.5000	6.5000	24.5000
	MIN	4.0000	3.0000	0.4000	0.4000	0.4000	0.4000
	MEAN	10.8833	6.3625	5.4187	5.7333	2.9200	7.6540
	STD.DEV	6.5013	3.3406	6.2788	5.4142	2.2665	6.2512
00666 DISSOLVED PHOSPHORUS MG/L	NO.POTW	2.0000	4.0000	8.0000	12.0000	2.0000	14.0000
	MAX	5.4000	8.4000	8.0000	8.4000	8.0000	8.4000
	MIN	4.3000	2.3000	1.8000	1.8000	4.0000	1.8000
	MEAN	4.8500	4.4750	4.1125	4.2333	6.0000	4.3214
	STD.DEV	0.7778	2.7072	1.8310	2.0406	2.8284	1.9027
01040 COPPER, DISSOLVED MG/L AS CU	NO.POTW	32.0000	10.0000	10.0000	20.0000	6.0000	53.0000
	MAX	11.7000	0.1300	1.4000	1.4000	0.1300	11.7000
	MIN	0.0600	0.0300	0.0100	0.0100	0.0100	0.0100
	MEAN	0.5005	0.0730	0.2300	0.1515	0.0483	0.3724
	STD.DEV	2.0440	0.0422	0.4466	0.3191	0.0431	1.6011
01090 ZINC, DISSOLVED MG/L AS ZN	NO.POTW	26.0000	7.0000	9.0000	16.0000	4.0000	43.0000
	MAX	3.2500	0.1000	1.1600	1.1600	0.0600	3.2500
	MIN	0.0400	0.0500	0.0100	0.0100	0.0100	0.0100
	MEAN	0.3961	0.0671	0.2678	0.1800	0.0425	0.3190
	STD.DEV	0.6701	0.0160	0.4380	0.3361	0.0236	0.5659
01030 CHROMIUM, DISSOLVED MG/L AS CR	NO.POTW	31.0000	10.0000	10.0000	20.0000	6.0000	52.0000
	MAX	0.5600	0.0100	0.7000	0.7000	0.1000	0.7000
	MIN	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	MEAN	0.0723	0.0100	0.1120	0.0610	0.0250	0.0679
	STD.DEV	0.1097	0.0000	0.2183	0.1591	0.0367	0.1330
01049 LEAD, DISSOLVED MG/L AS PB	NO.POTW	31.0000	10.0000	10.0000	20.0000	6.0000	52.0000
	MAX	0.2000	0.1000	0.1000	0.1000	0.1000	0.3000
	MIN	0.1000	0.0200	0.1000	0.0200	0.1000	0.0200
	MEAN	0.1087	[illegible]	0.1000	0.0960	0.1000	0.1081
	STD.DEV	0.0301	[illegible]	0.0	0.0179	0.0001	0.0378

NOTES:

1) NEGATIVE REMOVALS DELETED
2) PRIMARY (A) INCLUDES A01,A02
3) TRICKLING FILTER (B) INCLUDES B01,B02,B04,B05
4) ACTIVATED SLUDGE (C) INCLUDES C01,C02,C05,C06,C09,C19,C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

SUMMARY OF POTW EFFLUENT DATA

/PARAMETERS V	CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
01065 NICKEL, DISSOLVED MG/L AS NI	NO.POTW	31.0000	10.0000	10.0000	20.0000	6.0000	52.0000
	MAX	0.8200	0.1000	0.8000	0.8000	0.1000	0.8200
	MIN	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
	MEAN	0.1313	0.1000	0.1850	0.1425	0.1000	0.1350
	STD.DEV	0.1330	0.0	0.2212	0.1583	0.0001	0.1407
01025 CADMIUM, DISSOLVED MG/L AS CD	NO.POTW	31.0000	10.0000	10.0000	20.0000	6.0000	52.0000
	MAX	0.0300	0.0100	0.1200	0.1200	0.0100	0.1200
	MIN	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
	MEAN	0.0124	0.0100	0.0210	0.0155	0.0100	0.0137
	STD.DEV	0.0062	0.0000	0.0348	0.0246	0.0000	0.0158
01056 MANGANESE, DISSOLVED MG/L AS MN	NO.POTW	31.0000	10.0000	10.0000	20.0000	6.0000	52.0000
	MAX	0.3600	0.1100	0.2600	0.2600	0.1100	0.3600
	MIN	0.0005	0.0300	0.0200	0.0200	0.0200	0.0005
	MEAN	0.1578	0.0740	0.1140	0.0940	0.0750	0.1348
	STD.DEV	0.0796	0.0280	0.0857	0.0653	0.0339	0.0807
71890 MERCURY, DISSOLVED MG/L AS HG	NO.POTW	25.0000	8.0000	9.0000	17.0000	4.0000	43.0000
	MAX	0.0017	0.0018	0.0010	0.0018	0.0007	0.0023
	MIN	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	MEAN	0.0005	0.0007	0.0006	0.0006	0.0005	0.0006
	STD.DEV	0.0004	0.0005	0.0083	0.0004	0.0003	0.0005
70507 TOT ORTHO-PHOSPHATE MG/L	NO.POTW	33.0000	20.0000	13.0000	33.0000	6.0000	60.0000
	MAX	7.7000	13.0000	28.0000	28.0000	6.6000	28.0000
	MIN	0.7000	0.7000	0.1000	0.1000	1.0000	0.1000
	MEAN	3.2524	5.2875	5.6000	5.4106	2.7167	4.3762
	STD.DEV	1.6278	3.8093	8.3430	5.8942	2.0331	4.3830
00690 TOT CARBON MG/L AS C	NO.POTW	28.0000	10.0000	6.0000	16.0000	4.0000	46.0000
	MAX	580.0000	160.0000	90.0000	160.0000	160.0000	580.0000
	MIN	88.0000	50.0000	24.0000	24.0000	40.0000	24.0000
	MEAN	180.6964	81.5000	56.3333	72.0625	81.5000	145.4239
	STD.DEV	95.0200	35.2334	22.5359	32.7481	53.6002	94.1036
00900 HARDNESS, TOTAL MG/L	NO.POTW	14.0000	6.0000	6.0000	12.0000	0.0	26.0000
	MAX	330.0000	110.0000	632.0000	632.0000	0.0	632.0000
	MIN	30.0000	32.0000	60.0000	32.0000	0.0	30.0000
	MEAN	103.8571	80.6667	191.3333	136.0000	0.0	118.6923
	STD.DEV	76.2000	33.9097	221.4921	161.7472	0.0	121.6461
00425 ALKALINITY -BICARBONATE MG/L	NO.POTW	11.0000	4.0000	4.0000	8.0000	0.0	19.0000
	MAX	300.0000	160.0000	104.0000	160.0000	0.0	300.0000
	MIN	74.0000	102.0000	22.0000	22.0000	0.0	22.0000
	MEAN	155.0000	122.0000	62.0000	92.0000	0.0	128.4737
	STD.DEV	74.6980	25.8716	42.9884	45.9065	0.0	70.2899

NOTES:

1) NEGATIVE REMOVALS DELETED
2) PRIMARY (A) INCLUDES A01,A02
3) TRICKLING FILTER (B) INCLUDES B01,B02,B04,B05
4) ACTIVATED SLUDGE (C) INCLUDES C01,C02,C05,C06,C09,C19,C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

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/PARAMETERS V		CATEGORY ------->	PRIMARY (A)	TRICKLING FILTER (B)	ACTIVATED SLUDGE (C)	BIOLOGICAL PLANTS (B+C)	SECONDARY PLANTS	TOTAL ALL PLANTS (A+B+C+OTHER)
00650	TOTAL	NO.POTW	16.0000	21.0000	11.0000	32.0000	0.0	49.0000
PHOSPHATE	MG/L	MAX	68.0000	36.5000	90.0000	90.0000	0.0	90.0000
		MIN	15.5000	1.5600	1.1000	1.1000	0.0	1.1000
		MEAN	31.0187	17.2709	24.6991	19.8243	0.0	23.6516
		STD.DEV	12.8231	10.3413	23.4743	16.1120	0.0	15.7270
00070	TURBIDITY	NO.POTW	7.0000	12.0000	8.0000	20.0000	0.0	30.0000
	JTU	MAX	[illegible].5000	99.0000	54.0000	99.0000	0.0	99.0000
		MIN	25.0000	15.0000	3.0000	3.0000	0.0	3.0000
		MEAN	48.5000	34.5250	23.7625	30.2200	0.0	34.4400
		STD.DEV	19.[illegible]915	21.8395	14.3987	19.5392	0.0	20.8352
00671	DISSOLVED	NO.POTW	3.0000	3.0000	3.0000	6.0000	2.0000	10.0000
ORTHOPHOSPHATE	MG/L	MAX	40.0000	6.7500	3.0000	6.7500	1.2000	40.0000
		MIN	1.4000	4.2000	0.1600	0.1600	0.1600	0.1600
		MEAN	14.9667	5.1500	1.4533	3.3017	0.6800	7.9710
		STD.DEV	21.7049	1.3937	1.4368	2.3880	0.7354	12.0081
01037	COBALT,TOT	NO.POTW	2.0000	0.0	2.0000	2.0000	0.0	5.0000
	UG/L AS CO	MAX	30.0000	0.0	20.0000	20.0000	0.0	30.0000
		MIN	20.0000	0.0	20.0000	20.0000	0.0	20.0000
		MEAN	25.0000	0.0	20.0000	20.0000	0.0	22.0000
		STD.DEV	7.0711	0.0	0.0271	0.0271	0.0	4.4721
01007	BARIUM,TOT	NO.POTW	1.0000	1.0000	1.0000	2.0000	0.0	3.0000
	UG/L AS BA	MAX	160.0000	100.0000	5800.0000	5800.0000	0.0	5800.0000
		MIN	160.0000	100.0000	5800.0000	100.0000	0.0	100.0000
		MEAN	160.0000	100.0000	5800.0000	2950.0000	0.0	2020.0300
		STD.DEV	0.0000	0.0000	0.0000	4030.5212	0.0	3273.6921
00076	TURBIDITY	NO.POTW	1.0000	2.0000	1.0000	3.0000	1.0000	4.0000
	FTU	MAX	57.0000	25.0000	6.0000	25.0000	6.0000	57.0000
		MIN	57.0000	10.0000	6.0000	6.0000	6.0000	6.0000
		MEAN	57.0000	17.5000	6.0000	13.6667	6.0000	24.5000
		STD.DEV	0.0000	10.6066	0.0000	10.0167	0.0000	23.1588

NOTES:
1) NEGATIVE REMOVALS DELETED
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4) ACTIVATED SLUDGE (C) INCLUDES C01,C02,C05,C06,C09,C19,C20
5) SECONDARY PLANTS ARE THOSE BIOLOGICAL PLANTS WITH EFFLUENT BOD-5 AND SS LESS THAN OR EQUAL TO 30MG/L
AND GREATER THAN OR EQUAL TO 85% REMOVAL FOR BOTH PARAMETERS

TABLE 6-1

CUMULATIVE FREQUENCY DISTRIBUTION
OF REMOVAL DATA
(PERCENT OF PLANTS)

PERCENT REMOVAL	%	0	10	20	30	40	50	60	70	80	90	100	N
CADMIUM	- PP	100	26	19	6	6	3	3	3	0			31
	- TFP	100	43	43	37	26	9	9	3	0			35
	- ASP	100	34	30	27	23	16	11	7	2	0		44
	- BP	100	38	35	32	23	12	10	5	1	0		79
CHROMIUM	- PP	100	61	44	36	25	19	19	6	0			36
	- TFP	100	71	67	60	48	31	21	17	8	4	0	48
	- ASP	100	74	74	67	56	43	41	39	20	10	0	54
	- BP	100	73	71	64	52	37	31	20	15	6	0	102
LEAD	- PP	100	56	50	41	24	15	9	9	3	0		34
	- TFP	100	71	59	54	51	34	27	15	10	5	0	41
	- ASP	100	67	59	57	53	43	31	20	8	2	0	49
	- BP	100	69	59	56	52	39	29	18	9	3	0	90
MERCURY	- PP	100	62	52	33	33	29	19	14	0			21
	- TFP	100	70	60	55	50	10	10	0				20
	- ASP	100	71	65	62	44	29	18	12	6	0		34
	- BP	100	70	63	59	46	26	22	11	7	4	0	54
COPPER	- PP	100	70	47	34	27	18	11	9	0			44
	- TFP	100	98	92	76	71	51	39	31	22	8	0	49
	- ASP	100	97	94	78	75	63	51	37	19	3	0	63
	- BP	100	97	93	77	73	58	46	34	21	5	0	112
NICKEL	- PP	100	18	7	7	4	4	4	4	4	4	0	28
	- TFP	100	56	50	34	16	13	8	6	3	0		32
	- ASP	100	59	43	30	16	8	4	4	0			49
	- BP	100	58	46	32	16	10	5	5	1	0	0	81
ZINC	- PP	100	82	61	39	32	26	13	3	3	0		38
	- TFP	100	93	87	79	62	40	29	15	6	0		52
	- ASP	100	95	91	84	81	64	52	40	22	9	0	58
	- BP	100	94	89	82	72	53	41	28	15	5	0	110
IRON	- PP	100	93	81	67	41	26	15	11	4	0		37
	- TFP	100	93	90	77	60	40	30	23	20	0		30
	- ASP	100	97	91	85	74	71	63	49	31	23		35
	- BP	100	95	91	82	68	57	48	37	26	12	0	65
MANGANESE	- PP	100	37	18	12	6	6	6	6	6	0		16
	- TFP	100	76	66	47	33	28	9	4	0			21
	- ASP	100	73	68	47	42	31	21	21	15	15	0	19
	- BP	100	75	68	47	38	30	15	13	8	8	0	40
PHOSPHORUS TOTAL	- PP	INSUFFICIENT DATA											
	- TFP	100	75	50	33	20	12	4	4	4	4	0	24
	- ASP	100	88	77	69	50	33	25	13	8	2	0	36
	- BP	100	83	67	55	38	25	17	10	7	3	0	60
TOTAL "KJELDAHL" NITROGEN	- PP	INSUFFICIENT DATA											
	- TFP	100	90	80	70	60	50	40	35	15	5	0	20
	- ASP	100	90	63	45	27	18	18	18	9	9	0	11
	- BP	100	90	74	61	48	39	32	29	13	6	0	31
AMMONIA	- PP	100	71	38	23	9	7	4	0				42
	- TFP	100	79	77	56	41	31	27	20	16	8	0	48
	- ASP	100	93	78	63	55	44	34	29	25	17	0	47
	- BP	100	86	78	60	48	32	30	25	21	13	0	95
PHENOLICS	- PP	INSUFFICIENT DATA											
	- TFP	100	83	83	67	67	58	50	25	8	0		12
	- ASP	100	94	88	81	81	75	69	63	50	31	0	16
	- BP	100	89	86	75	75	68	61	46	32	18	0	28
TOTAL ORGANIC CARBON	- PP	100	70	50	33	27	17	0					30
	- TFP	100	96	96	96	91	87	70	39	17	0		23
	- ASP					100	92	92	77	13	0		13
	- BP	100	97	97	97	94	89	78	53	19	0	0	36
CHEMICAL OXYGEN DEMAND	- PP	100	83	44	33	11	11	11	11	6	0		18
	- TFP				100	94	86	81	56	31	11	0	36
	- ASP			100	98	98	95	83	73	48	15	0	40
	- BP	100	100	100	99	96	91	82	64	39	13	0	76
SUSPENDED SOLIDS	- PP		100	96	85	74	53	34	11	4	2	0	47
	- TFP		100	98	95	92	86	85	73	45	24	0	66
	- ASP	100	98	98	95	94	87	76	66	56	34	0	62
	- BP	100	99	98	95	93	87	80	70	51	29	0	128

TABLE 6-1 (Continued)

CUMULATIVE FREQUENCY DISTRIBUTION
OF REMOVAL DATA
(PERCENT OF PLANTS)

PERCENT REMOVAL		0	10	20	30	40	50	60	70	80	90	100	N
BIOCHEMICAL OXYGEN DEMAND	- PP	100	83	65	42	29	17	12	6	2	0		52
	- TFP	100	98	98	97	97	92	88	77	63	20	0	60
	- ASP		100	98	96	98	97	92	83	72	46	0	65
	- BP	100	99	98	98	98	94	90	80	68	34	0	125

NOTES:
1) PP - Primary Plants (A01, A02)
2) TFP - Trickling Filter Plants (B01, B02, B04, B05)
3) ASP - Activated Sludge Plants (C01, C02, C05, C06, C09, C19, C20)
4) BP - Biological Plants (TFP + ASP)
5) N - Number of Plants

TABLE 6-2

CUMULATIVE FREQUENCY DISTRIBUTION
OF EFFLUENT DATA
(PERCENT OF PLANTS)

EFFLUENT CONCENTRATION (ug/l) ≥	0	4	8	12	16	20	24	28	32	36	40	N
CADMIUM - PP	100	89	80	40	37	34	11	9	0			35
- TFP	100	83	68	22	17	15	5	5	2	2	2	41
- ASP	100	92	75	31	27	19	4	4	2	2	2	48
- BP	100	88	72	27	22	17	4	4	2	2	2	89

EFFLUENT CONCENTRATION (ug/l) ≥	0	50	100	150	200	250	300	350	400	450	500	
CHROMIUM- PP	100	73	45	28	25	18	15	13	10	10	8	40
- TFP	100	48	35	25	23	21	21	17	17	12	12	52
- ASP	100	42	25	17	15	12	12	12	12	8	8	60
- BP	100	45	29	21	19	16	16	14	14	10	10	112

EFFLUENT CONCENTRATION (ug/l) ≥	0	50	100	150	200	250	300	350	400	450	500	
LEAD - PP	100	81	54	30	24	5	5	5	3	3	3	37
- TFP	100	58	24	13	9	9	9	9	9	7	7	45
- ASP	100	57	14	10	8	2	0					51
- BP	100	57	19	11	8	5	4	4	4	3	3	96

EFFLUENT CONCENTRATION (ug/l) ≥	0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	
MERCURY - PP	100	70	30	17	9	9	9	9	9	9	9	23
- TFP	100	77	27	14	14	5	5	5	5	5	5	22
- ASP	100	62	32	16	14	11	5	5	5	5	5	37
- BP	100	68	31	15	14	8	5	5	5	5	5	59

EFFLUENT CONCENTRATION (ug/l) ≥	0	50	100	150	200	250	300	350	400	450	500	
COPPER - PP	100	88	54	33	25	19	19	13	13	10	8	48
- TFP	100	52	30	13	13	9	9	9	9	9	6	54
- ASP	100	51	31	13	9	4	4	3	1	1	1	68
- BP	100	52	30	13	11	7	7	6	5	5	3	122

EFFLUENT CONCENTRATION (ug/l) ≥	0	50	100	150	200	250	300	350	400	450	500	
NICKEL - PP	100	64	39	12	9	9	9	6	6	6	6	33
- TFP	100	66	47	29	26	16	16	16	16	13	11	38
- ASP	100	57	23	11	11	7	5	5	4	4	4	56
- BP	100	61	33	18	17	11	10	10	9	7	6	94

EFFLUENT CONCENTRATION (ug/l) ≥	0	100	200	300	400	500	600	700	800	900	1000	
ZINC - PP	100	92	71	51	31	31	27	24	22	20	16	49
- TFP	100	79	39	26	19	16	11	9	9	9	7	57
- ASP	100	65	39	18	14	12	9	8	8	3	3	66
- BP	100	72	39	22	16	14	10	8	8	6	5	123

EFFLUENT CONCENTRATION (ug/l) ≥	0	600	1200	1800	2400	3000	3600	4200	4800	5400	6000	
IRON - PP	100	90	53	30	20	10	3	3	3	0		30
- TFP	100	65	24	12	9	6	6	6	6	6	6	34
- ASP	100	30	16	8	3	3	3	3	3	3	3	37
- BP	100	46	20	10	6	4	4	4	4	4	4	71

EFFLUENT CONCENTRATION (ug/l) ≥	0	60	120	180	240	300	360	420	480	540	600	
MANGANESE - PP	100	82	64	41	36	18	9	0				22
- TFP	100	68	39	21	14	14	11	4	4	4	0	28
- ASP	100	78	26	17	13	13	9	9	4	4	4	23
- BP	100	73	33	20	14	14	10	6	4	4	2	51

EFFLUENT CONCENTRATION (mg/l) ≥	0	2	4	6	8	10	12	14	16	18	20	
PHOSPHORUS- PP	100	90	80	60	50	10	10	10	10	10	10	10
TOTAL - TFP	100	100	89	70	63	41	26	7	7	4	0	27
- ASP	100	93	58	38	20	5	0					40
- BP	100	96	70	51	37	19	10	3	3	1	0	67

EFFLUENT CONCENTRATION (mg/l) ≥	0	5	10	15	20	25	30	35	40	45	50	
TOTAL - PP	INSUFFICIENT DATA											
KJELDAHL - TFP	100	86	67	48	29	10	10	10	5	5	0	21
NITROGEN - ASP	100	83	83	67	58	25	8	0				12
- BP	100	85	73	55	39	15	9	6	3	3	0	33

EFFLUENT CONCENTRATION (mg/l) ≥	0	4	8	12	16	20	24	28	32	36	40	
AMMONIA - PP	100	97	84	57	40	24	17	11	5	3	3	63
- TFP	100	86	69	57	36	26	14	11	8	6	5	65
- ASP	100	79	59	43	25	13	5	0				63
- BP	100	83	64	50	31	20	9	5	4	3	2	128

TABLE 6-2 (Continued)

CUMULATIVE FREQUENCY DISTRIBUTION
OF EFFLUENT DATA
(PERCENT OF PLANTS)

EFFLUENT CONCENTRATION (ug/1) ≥		0	1	2	3	4	5	6	7	8	9	10	
PHENOLICS	- PP			INSUFFICIENT DATA									
	- TFP	100	38	38	38	38	38	38	38	38	38	31	13
	- ASP	100	75	75	50	38	31	31	31	31	13	6	16
	- BP	100	59	59	45	38	34	34	34	34	24	17	29

EFFLUENT CONCENTRATION (mg/1) ≥		0	30	60	90	120	150	180	210	240	270	300	
TOTAL	- PP	100	100	97	77	54	31	17	5	9	3	3	35
ORGANIC	- TFP	100	96	30	13	4	0						23
CARBON	- ASP	100	50	14	7	0							14
	- BP	100	78	24	11	3	0						37

EFFLUENT CONCENTRATION (mg/1) ≥		0	40	80	120	160	200	240	280	320	360	400	
CHEMICAL	- PP	100	100	89	89	79	68	63	63	56	42	37	19
OXYGEN	- TFP	100	94	72	47	22	14	6	8	3	3	0	36
DEMAND	- ASP	100	78	43	20	15	8	[illegible]	0				40
	- BP	100	86	57	33	18	11	5	4	1	1	0	76

EFFLUENT CONCENTRATION (mg/1) ≥		0	20	40	60	80	100	120	140	160	180	200	
SUSPENDED	- PP	100	98	93	78	48	24	20	13	11	9	9	54
SOLIDS	- TFP	100	73	42	17	9	6	5	3	2	2	2	66
	- ASP	100	58	31	20	11	8	6	6	3	2	0	64
	- BP	100	65	27	18	10	7	5	5	2	2	1	130

EFFLUENT CONCENTRATION (mg/1) ≥		0	20	40	60	80	100	120	140	160	180	200	
BIOCHEMICAL	- PP	100	100	97	93	86	74	59	52	45	36	28	58
OXYGEN	- TFP	100	82	31	20	15	13	6	7	5	5	3	61
DEMAND	- ASP	100	40	20	8	5	5	5	5	3	3	2	65
	- BP	100	60	30	13	10	9	6	6	4	4	2	126

NOTES:
1) PP - Primary Plants (A01, A02)
2) TFP - Trickling Filter Plants (B01, B02, B04, B05)
3) ASP - Activated Sludge Plants (C01, C02, C05, C06, C09, C19, C20)
4) BP - Biological Plants (TFP + ASP)
5) N - Number of Plants

Evaluation of Limited Data

Table 6-3 is a summary of removal and effluent data for oil and grease, cyanide (total), and hexavalent chromium in primary and biological treatment plants. The data presented for oil and grease is a combination of the original oil and grease data obtained by three distinct analytical methods as distinguished by STORET numbers 00550, 00556, and 00560.

Of these parameters, oil and grease removal was most significant with approximately 50 percent removal achieved in primary plants and an average removal of 74 percent in biological plants. It was noted that the oil and grease removal for biological plants ranged from 19 to nearly 98%. The variability of oil and grease removal is probably due to a variety of factors specific to the municipal plant (i.e., detention time, biomass acclimation, influent concentration, skimmers, type and chain length of oil and grease, presence of other pollutants, etc.). For plants reporting oil and grease data, pass through was 25-27.8 mg/l in primary plants, and averaged 9.5 mg/l in biological plants.

Removal of cyanide and hexavalent chromium was reported only by biological treatment facilities. Removal varied from 3 to 29 percent and 0 to 18 percent respectively, thus indicating only incidental removal of these pollutants in biological treatment plants. Corresponding effluent values were 0.01 to 3.7 mg/l for cyanide and 10 to 15 μg/l for hexavalent chromium. As a result of the limited number of plants reporting oil and grease, cyanide and hexavalent chromium data, this information should not be considered conclusive, but rather indicative of the performance of similar treatment facilities.

A limited amount of data was also reported on biological treatment plants with chemical addition, and tertiary plants. Tertiary plants include facilities designated as C07, C08, C10, D01, D02, D06, and D07, as defined in Appendix 6, Report No. 2. Table 6-4 summarizes this data with mean and median values for removal reported, along with the number of plants reporting data. Again, no attempt was made to characterize the performance of these plants due to the limited extent of the data base. Nevertheless, the table confirms the expected general improved removal of metals experienced in plants utilizing chemical addition.

Table 6-5 is presented to facilitate a comparison of pollutant removals in biological and secondary treatment plants. Biological plants include all trickling filter and activated sludge facilities as defined in the table. In this analysis, secondary plants were defined as those biological plants with effluent BOD and SS equal to or less than 30 mg/l, and achieving 85% or greater removal for both parameters, for the data reported.

It should be noted that this definition is more restrictive than the prescribed method for determining secondary treatment, as specified in the Federal Register (Appendix 2). This results from the fact that the regulatory definition of secondary treatment provides for compliance with the limitations outlined above over a 30 day period, utilizing an arithmetic mean of observed values. On the other hand, the data utilized in the computer analysis to a large degree represents influent and effluent values obtained over a one day period only. As a result, many treatment plants satisfying the official definition of secondary treatment did not qualify as such in this analysis, thus accounting for the relatively small number of secondary plants shown in the table.

Nevertheless, the limited data generated in this analysis generally confirms the expected result of greater removals being achieved in plants meeting the definition of secondary treatment. Of the eleven parameters reported in the table, higher removals were attained on secondary plants for eight pollutants, including chromium, lead, mercury, copper, zinc, ammonia, total organic carbon and chemical oxygen demand. The parameters for which increased removals were not experienced in secondary plants included only cadmium, nickel and phenol.

TABLE 6-3
REMOVAL AND EFFLUENT DATA SUMMARY FOR OIL AND GREASE, CYANIDE AND HEXAVALENT CHROMIUM

	Primary Plants (PP)				Biological Treatment Plants (BP)			
	Percent Removal		Effluent Concentration		Percent Removal		Effluent Concentration	
	Mean	N	Mean	N	Mean	N	Mean	N
O&G (mg/l)	48	6	27.8	6	74.0	13	9.5	25
CYN (mg/l)	0	1	0.075	4	29.0	14	3.672	28
HEX. CR. (µg/l)	0	3	17.0	3	18.0	19	15.0	20

Notes:

1. PP = A01, A02 (Ref. Appendix 6, Report No. 2)
2. BP = TFP + ASP = B01, B02, B04, B05, C01, C02, C05, C06, C09, C19, C20.
3. N = Number of plants reported.

TABLE 6-4
REMOVAL IN BIOLOGICAL PLANTS WITH CHEMICAL ADDITION, AND TERTIARY PLANTS

	Biological w/Chem Addition		Tertiary	
	Median/Mean % Removal	No. of Plants	Median/Mean % Removal	No. of Plants
CD	0/0	4	0/6	5
CR	67/70	6	14/32	7
PB	38/39	6	31/44	10
HG	33/34	5	17/22	4
CU	80/75	5	79/73	9
NI	75/62	7	13/18	5
ZN	79/72	8	77/63	7
FE	84/84	3	94/82	8
MN	39/39	2	47/53	5
P-TOTAL	80/78	6	41/43	6
TKN	51/57	6	88/88	2
NH_3	45/56	5	89/80	9
PHENOL	82/82	2	85/65	4
TOC	79/79	3	75/74	3
COD	87/78	5	88/84	10
SS	83/78	8	93/90	11
BOD	93/86	6	95/90	11

Note:

1. Biological plants with chemical addition are as follows: BO3, CO3, CO4, C14. (Reference Appendix 6, Report No. 2).

2. Tertiary Plants are as follows: CO7, CO8, C10, D01, D02, D06, D07. (Reference Appendix 6, Report No. 2).

TABLE 6-5
REMOVAL IN BIOLOGICAL AND SECONDARY TREATMENT PLANTS

Parameter	Biological Plants (BP)		Secondary Plants	
	Percent Removal (mean)	Number of Plants(3)	Percent Removal (mean)	Number of Plants
CD	15	57	10	11
CR	43	71	52	20
PB	37	66	46	19
HG	35	43	49	14
CU	58	75	69	22
NI	19	60	9	16
ZN	55	73	71	19
NH_3	46	74	65	26
PHEN	71	16	65	7
TOC	69	35	79	8
COD	72	43	82	20

Notes:

1. BP = TFP + ASP = B01, B02, B04, B05, C01, C02, C05, C06, C09, C19, C20 plants.
2. Secondary plants are those biological plants with effluent BOD and SS equal to or less than 30 mg/1, and achieving 85% or greater removal of both parameters for the data reported.
3. Number of biological plants which also reported BOD and SS data.

Correlation Analyses

Correlation analyses were performed to determine the degree of linear relationship for influent concentration versus percent removal, suspended solids removal versus percent removal, influent pH versus percent removal, and influent concentration versus effluent concentration for nine metal parameters. Table 6-6 is a summary of the correlation coefficients obtained. Of the four relationships investigated, only influent concentration versus effluent concentration exhibited a consistently high degree of correlation. This relationship was therefore pursued further in the regression analyses which follow.

The possibility of a linear relationship with log combinations for influent concentration versus percent removal, suspended solids removal versus percent removal, and influent pH versus percent removal for cadmium, chromium, and lead was investigated in Table 6-7. No consistent high degree of correlation was exhibited in this analysis.

Regression Analyses

Polynomial regression analyses were performed to determine the line of best fit for the reported data in the relationship of influent concentration to effluent concentration. The regression equation along with the standard error of estimate (Se), the standard deviation for effluent concentrations reported (Ys), and the maximum and minimum reported influent concentrations (X max, X min) is presented in Table 6-8 for nine total metals' parameters. Three to six degrees of polynomial regression were examined for each parameter, with the selection of regression equations based on the minimum reasonable Se/Ys ratio.

Taking into account the standard error of estimate, and within the limits of influent concentrations X max, and X min, the regression equations in Table 6-8 may be utilized to estimate an effluent concentration from a given influent concentration, or conversely to estimate an influent concentration from a given effluent limitation.

TABLE 6-6
CORRELATION COEFFICIENT

Parameter	Influent Conc. vs. % Removal				SS % Removal vs. % Removal				pH - Influent vs. % Removal				Influent Conc. vs. Effluent Conc.			
	PP	TFP	ASP	N (PP/TFP/ASP)	PP	TFP	ASP	N (PP/TFP/ASP)	PP	TFP	ASP	N (PP/TFP/ASP)	PP	TFP	ASP	N (PP/TFP/ASP)
CD	-0.02	0.33	0.22	31/25/44	-0.25	0.06	0.27	17/28/30	0.19	-0.29	0.37	13/25/21	0.97	0.83	1.00	31/35/44
CR	0.19	0.38	0.22	26/48/54	-0.02	0.18	0.43	19/37/40	0.12	-0.07	-0.13	18/34/27	0.98	0.81	0.84	36/48/54
PB	0.63	0.40	0.41	34/41/49	0.03	0.07	0.17	21/32/41	0.17	-0.41	0.07	17/30/32	0.58	0.67	0.77	34/41/49
HG	0.03	0.22	0.26	21/20/34	0.54	0.32	0.41	11/16/28	-0.69	0.01	0.10	9/11/20	0.89	1.00	0.76	21/20/34
CU	-0.03	0.21	-0.01	44/49/63	-0.17	0.36	0.30	20/36/43	-0.27	-0.13	-0.25	27/36/37	0.97	0.87	0.67	44/49/63
NI	0.23	0.52	-0.14	28/32/49	-0.26	-0.04	0.06	19/26/36	0.01	0.05	-0.01	15/20/25	0.94	0.63	1.00	28/32/49
ZN	0.02	0.15	0.40	38/52/58	0.06	0.50	0.56	18/40/44	0.03	0.11	-0.07	21/38/34	0.96	0.93	0.61	38/52/58
FE	0.45	-0.15	0.13	27/30/35	0.56	0.56	0.56	12/25/32	0.07	-0.02	0.33	22/29/33	0.67	0.99	0.57	27/30/35
MN	0.06	0.31	0.12	16/21/19	-0.08	0.18	0.11	14/21/18	-0.32	0.18	-0.29	12/20/16	0.92	0.85	0.95	16/21/19

Notes:

1. PP = A01, A02 plants (Ref. Appendix 6, Report No. 2)
2. TFP = B01, B02, B04, B05 (Ref. Appendix 6, Report No. 2)
3. ASP = C01, C02, C05, C06, C09, C19, C20 (Ref. Appendix 6, Report No. 2)
4. N = Number of plants reported.

TABLE 6-7
CORRELATION COEFFICIENT (LOG)

Parameter	Log Inf. Conc. vs. Log % Rem.			Log Inf. Conc. vs. % Removal			Influent Conc. vs. Log % Rem.		
	PP	TFP	ASP	PP	TFP	ASP	PP	TFP	ASP
CD	-0.13	-0.001	0.33	-0.05	0.05	0.38	-0.04	0.24	0.23
CR	0.62	0.50	0.62	0.45	0.61	0.67	0.28	0.22	0.20
PB	0.51	0.38	0.32	0.59	0.58	0.43	0.43	0.21	0.30

	Log SS % Rem. vs. Log % Rem.			Log SS % Rem. vs. % Rem.			SS % Rem. vs. Log % Rem.		
	PP	TFP	ASP	PP	TFP	ASP	PP	TFP	ASP
CD	-0.38	0.11	0.30	-0.23	0.08	0.26	-0.37	0.08	0.33
CR	0.57	0.20	0.44	0.63	0.18	0.42	0.54	0.18	0.41
PB	0.02	-0.10	0.09	0.09	0.06	0.17	-0.03	-0.10	0.05

	pH - Influent vs. Log % Rem.		
	PP	TFP	ASP
CD	0.32	-0.36	0.27
CF	0.35	-0.09	-0.11
PB	0.34	-0.32	-0.02

Notes:

1. PP = A01, A02 plants (Ref. Appendix 6, Report No. 2)
2. TFP = B01, B02, B04, B05 (Ref. Appendix 6, Report No. 2)
3. ASP = C01, C02, C05, C06, C09, C19, C20 (Ref. Appendix 6, Report No. 2)

TABLE 6-8

REGRESSION ANALYSES - INFLUENT CONC. (X) vs. EFFLUENT CONC.(Y)

	PRIMARY PLANTS (PP)					TRICKLING FILTER PLANTS (TFP)					ACTIVATED SLUDGE PLANTS (ASP)				
Parameter	Regression Equation	S_e	Y_s (µg/l)	X_{Max}	X_{Min}	Regression Equation	S_e	Y_s (µg/l)	X_{Max}	X_{Min}	Regression Equation	S_e	Y_s (µg/l)	X_{Max}	X_{Min}
CD	$Y = 0.39 + 0.99\ x$	1.7	7.3	30	3	$Y = 5.08 + 0.34\ x$	-	6	90	2	$Y = 3.16 + 0.48\ x$	9	295	4130	3
CR	$Y = 14.6 + 0.69\ x$	90	442	3600	6	$Y = -26.2 + 0.53\ x-2(10^{-5})x^2$	215	546	14000	4	$Y = -1.30 + 0.36\ x$	211	389	5600	5
PB	$Y = 16.3 + 0.73\ x -0.001x^2$	54	79	1040	10	$Y = -5.33 + 0.53\ x-0.0001x^2$	147	287	7750	5	$Y = 25.6 + 0.26\ x$	34	52	930	5
HG	$Y = -0.13 + 0.81\ x$	0.7	1.4	5	0.1	$Y = 0.09 + 0.52\ x$	0.1	2.1	19	0.2	$Y = 2.72-1.02x+0.01x^2$	15	34	300	0.2
CU	$Y = -10.2 + 0.79\ x$	73	289	1900	30	$Y = 64.9 + 0.15\ x$	148	301	12000	20	$Y = 7.48 + 0.18\ x$	53	71	630	30
NI	$Y = -8.00 + 0.90\ x$	108	312	1700	9	$Y = 14.9 + 0.88x-0.0001x^2$	63	365	8300	12	$Y = -29.5 + x$	61	5706	40000	9
ZN	$Y = -56.9 + 0.76\ x$	194	685	4300	40	$Y = -10.7 + 0.51\ x$	165	440	4800	94	$Y = 73.1 + 0.19\ x$	136	169	2200	60
FE	$Y = 650-0.01x+0.0002x^2 -2(10^{-8})x^3$	713	1055	9000	620	$Y = -829 + 0.76\ x$	1376	11894	85700	160	$Y = -927 + 2.15\ x -0.001\ x^2 + 8\ (10^{-8})\ x^3$	641	1200	7367	250
MN	$Y = 3.97 + 0.82\ x$	37	91	370	46	$Y = 5.85 + 0.60\ x$	43	81	436	30	$Y = 24.7 + 0.47\ x$	69	215	2020	35

Notes:

1. Y_s = Standard deviation (of effluent concentration reported)
2. S_e = Standard error of estimate
3. X_{Max} = Maximum reported influent concentration
4. X_{Min} = Minimum reported influent concentration
5. PP = A01, A02 plants (Ref. Appendix 6, Report No. 2)
6. TFP = B01, B02, B04, B05 (Ref. Appendix 6, Report No. 2)
7. ASP = C01, C02, C05, C06, C09, C19, C20 (Ref. Appendix 6, Report No. 2)

APPENDIX 7
ANNOTATED BIBLIOGRAPHY

SECTION A - Introduction

SECTION B - Management of a Control Program

SECTION C - Legal Aspects of a Control Program

SECTION D - Monitoring

SECTION E - Pollutants which Interfere with Publicly Owned Treatment Works

SECTION F - Removal of Pollutants in Publicly Owned Treatment Works

SECTION A - INTRODUCTION

Reference: Volume I - Section A
Volume II - Appendices 1 & 2

A-1 Theories and Practices of Industrial Waste Treatment, Nemerow, Nelson Leonard, Addison-Wesley Publishing Company, Inc., Reading, Massachusetts, (1963).

This book is divided into four sections:

1. The effects of industrial wastes on a receiving stream and how to treat wastes to protect the stream.
2. Theories of waste treatment including solids removal, neutralization, equalization and proportioning, and removal of dissolved organics and inorganics.
3. Engineering practice and actual case studies which consider economics, public opinion, personality differences, local laws or customs, and previous community experience to help the reader put theories into practice.
4. A condensed evaluation of the nature of major industrial wastes - their origin, characteristics and treatments.

A-2 Projects in the Industrial Pollution Control Division - December, 1974, Environmental Protection Technology Series, EPA 600/2-75-001 (March, 1975).

This book is a compilation of information sheets from all projects initiated since fiscal year 1967 (through fiscal year 1974). Each sheet contains the objectives, statistical information, and a brief description of one project.

A-3 "Combined Tannery and Municipal Waste Treatment - Gloversville - Johnstown, New York," Nemerow, N. and R. Armstrong, Proceedings of the 21st Industrial Waste Conference, Purdue University, (1966), p. 447.

This article describes the stream survey used on the Cayadutta Creek to determine the waste treatment required for a combined tannery-municipal waste discharge flow. The sampling procedure used is indicated and the results are discussed. Laboratory scale treatment tests were conducted on the waste stream, and the results and conclusions are presented.

A-4 "Synthetic Organic Pesticides - An Evaluation of Their Persistence in Natural Water," Okey, Robert W. and Richard H. Bogan, Proceedings of the 11th Pacific Northwest Industrial Waste Conference, Corvallis, Oregon, Cir. No. 29, p. 222 (1963).

Metabolism studies were carried out with the Warburg microrespirometer, and the conventional 5-day 20°C biochemical oxygen demand test to determine the persistence (biodegradeability) of insecticides. The work was carried out in two principal phases. The first employed unacclimated activated sludge, and the second used acclimated activated sludge. A discussion of the results is included.

A-5 "Toxicity of Chemicals in Paper Factory Effluents," Norup, Bjarne, Water Research, Vol. 6, p. 1585 (1972)

This article presents the results of a study to demonstrate that PCP is as toxic to fish as the dangerous, previously used slimecides containing mercury. A discussion of the experimental results is given.

A-6 "Treatment Studies of Combined Textile and Domestic Wastes," Lauria, Donald T. and Charles A. Willis, Proceedings of the 19th Industrial Waste Conference, Purdue University, (1964), p. 45.

Pilot plant studies were conducted to evaluate a completely mixed biological process to treat combined domestic and industrial wastes, produced in the town of Valdese, North Carolina. The results of the pilot plant tests and conclusions are presented in this paper.

A-7 "Biomonitoring of Industrial Effluents," Jackson, Herbert W., and William A. Brungs, Jr., Proceedings of the 21st Industrial Waste Conference, Purdue University, (1966), p. 117.

This paper describes a method to determine the toxicity of wastewater by using tanks containing aquatic life. The death of fish signal a deleterious change of the wastewater. A schematic flow scheme of the system and operating procedures are given.

A-8 "Isolation and Identification of Anaerobic and Facultative Bacteria Present in the Digestion Process," Burbank, N. C., Jr., et.al., Proceedings of the 19th Industrial Waste Conference, Purdue University, (1964), p. 552.

The purpose of this study was fivefold:

1. To improve the equipment devised to cultivate anaerobic bacteria.
2. To improve the techniques for identifying anaerobic bacteria.
3. To isolate and identify the anaerobic bacteria and facultative bacteria present in sewage sludge.
4. To correlate the population of the bacteria to the operation of digesters.
5. To isolate and identify anaerobic and facultative bacteria present in the digestion process of meat packing wastes.

Results and conclusions are presented in this study.

A-9 "Industrial Wastewater Reclamation," Rambow, Carl A., Proceedings of the 23rd Industrial Waste Conference, Purdue University, (1968), p. 1.

The environmental and economic advantages of wastewater reclamation are presented in this paper. Specific case histories are presented where wastewater reclamation has demonstrated distinct advantages over other methods of treatment.

A-10 "Decision Factors - Separate Industry or Joint Municipal Waste Treatment," Sanders, Francis A., Proceedings of the 23rd Industrial Waste Conference, Purdue University, (1968), p. 1021.

This article discusses the advantages and disadvantages to both industry and communities of joint treatment. The factors which affect the decision of joint treatment, and the advantages of using a consulting engineer are also presented.

A-11 "Combined Waste Treatment at Grand Island, Nebraska," Gibbs, W.R., and Henry Benjes, Jr., Proceedings of the 22nd Industrial Waste Conference, Purdue University, (1967), p. 800.

This paper discusses the development of the conceptual design of the new sewage collection and treatment system at Grand Island, Nebraska. The detailed design and the operation of the treatment system are also presented.

A-12 Comparative Effects of Chemical Pretreatment on Carbon Adsorption, Westrick, James J., et al., presented at the Water Pollution Control Federation 47th Annual Conference, October 8-13, 1972.

Three physical-chemical pilot plants were operated, utilizing three different chemical clarification schemes preceding filtration and carbon adsorption. The purpose of the study was to compare effluent qualities from each plant. A method of data analysis was developed to permit simplistic comparison of carbon dosages and costs.

A-13 "Phys/Chem or Biological: Which Will You Choose?", Barth, E.F., and Jesse M. Cohen, Water & Wastes Engineering, (Nov., 1974).

The relative advantages and disadvantages of physical-chemical and biological wastewater treatment methods are discussed. Examples are given where combinations of both methods can satisfy a particular wastewater requirement.

A-14 "The Treatment of Industrial Wastewater for Reuse - Chrysler Indianapolis Foundry," Balden, A.R., and Paul R. Erickson, Proceedings of the 25th Industrial Waste Conference, Purdue University, (1970), p. 62.

This paper discusses the waste treatment plant designed for the Chrysler Indianapolis Foundry. The waste treatment plant handles the waste stream produced by the gas scrubbers, which contain iron particles, evaporated oils and phenols.

A-15 "Wastewater Load Evaluated at a Multi-Product Organic Chemical Plant," Morrissey, A. J. and S. A. LaRocca, Water and Sewage Works, Vol. 117, No. 5, p. 173, (May, 1970).

The wastewaters generated from a chemical plant are characterized and their effects on receiving waters are assessed. The sampling and analysis program is also discussed.

A-16 "Experience in the Treatment and Re-use of Industrial Waste Waters," Renn, Charles E., Proceedings of the 24th Industrial Waste Conference, Purdue University, (1969), p. 962.

The re-use of industrial waste waters at the Black and Decker Manufacturing Company's Hampstead, Maryland plant were discussed. A detailed description of the collection pond is given, and a discussion of the operating problems faced is also contained.

A-17 "Water Conservation and Reuse by Industry," Irvine, Robert L., Jr. and William B. Davis, Proceedings of the 24th Industrial Waste Conference, Purdue University (1969), p. 450.

The reasons why industry has not implemented in-plant water management programs for water conservation and reuse are discussed in this paper. The first part of the paper disputes these reasons; the second part discusses how the concepts of conservation and reuse aid in overall plant performance. The third part indicates how the efficiency of biological waste treatment facilities can be increased.

A-18 "Rough Days Ahead for Industry, but New Methods Gain," Heckroth, Charles W., Water and Wastes Engineering, (January, 1972), p. A2.

This article briefly discusses:

1. The W.P.C.F. meeting held in San Francisco in 1971, including EPA viewpoints regarding latest treatment technology.
2. Studies presented at the WPCF meeting on how five towns are handling both municipal and industrial wastewaters.
3. Advances in pulp and paper, food, plating, plastic, and mining waste treatment systems.

A-19 "Detection of Industrial Wastes in Municipal Systems," Delaney, Ladin, Journal of the Water Pollution Control Federation, Vol. 42, No. 4, p. 645, (April, 1970).

This article briefly discusses some basic procedures for detecting illegal discharges to sewerage systems. Specific case histories are presented to illustrate each of the author's suggestions.

A-20 "Acceptable Methods for the Utilization or Disposal of Sludges," U.S. E.P.A., 430/9-75, a preliminary draft of a technical bulletin, Supplement to Federal Guidelines: Design, Operation and Maintenance of Wastewater Treatment Facilities, 26 pp.

This bulletin discusses the factors important to the environmental acceptability of a particular sludge management system. The environmental assessment procedure to determine the acceptability of sludge disposal at a specific site is also discussed. Information on the constraints of various sludge disposal methods is presented.

A-21 "Wastewater Treatment for Small Communities," Part I, Tchobanoglous, George, Public Works, Vol. 105, No. 7, p. 58, (July, 1974).

This article defines some of the general problems associated with small waste treatment plants. Alternate treatment processes and design considerations for small plants are discussed. Economic comparisons between treatment processes are also given.

A-22 "Wastewater Treatment for Small Communities," Part 2, Tchobanoglous, George, Public Works, Vol. 105, No. 8, p. 58, (August, 1974).

Design considerations for small activated sludge systems are discussed. An economic evaluation of alternative processes is considered and illustrated. Capital and operating costs for various systems are shown.

A-23 Industrial Wastes, Rudolfs, W., Reinhold Publishing Corporation, New York, N. Y. (1953), 497 pp.

Brief descriptions of industrial waste-producing processes, sources of wastes, recovery and remedial measures, quantities and characteristics of the wastes, methods of treatment and the effects of the wastes on domestic sewage treatment processes are presented. Various contributors presented waste treatment fundamentals from the physical, chemical, biochemical and engineering viewpoints.

A-24 "Measuring Open Channel Wastewater Flows," Blois, R.S., Pollution Engr., Vol. 19, No. 6, P. 20, (Nov.-Dec., 1973).

The use of weirs to measure flow rates is discussed. Some basic designs are given, and simple flow recording methods are presented.

A-25 "Analytical Parameters of Petrochemical and Refinery Wastewaters," Ford, D.L., et. al., Journal of the Water Pollution Control Federation, Vol. 43, No. 8, p. 1712, (August, 1971).

This paper discusses the tests for BOD, COD, TOD, and TOC, and shows how these tests can be used to determine wastewater characterization and wastewater treatability.

A-26 "Unique System Solves Plastic Problem," Water and Wastes Engineering, Vol. 10, No. 5, p. C-20, (May, 1973).

This article briefly discusses the method used by the Marbon Chemical Division of Borg-Warner Corporation to determine whether a waste stream was biodegradeable. The analysis also produced the design parameters for the full scale plant.

A-27 "A Method for the Measurement of the Radioactive Content of Wastewater," Haughey, Francis J. and Raymond M. Manganelli, Journal of the Water Pollution Control Federation, Vol. 36, No. 1, p. 88, (January, 1964).

A method to measure the radioactive content of wastewater is presented in this article. The method accounts for the relationship between radioactivity and the various sewage solids fractions.

A-28 "Municipal Wastewater Treatment Plant Instrumentation," Babcock, Russel H., Water and Wastes Engineering, Vol. 5, No. 8, p. 47, (August, 1968).

This article briefly discusses instruments and controls that can be used in a sewage plant.

A-29 "Surveillance in Water Quality Management," Ward, Robert C., et al. Journal of the Water Pollution Control Federation, Vol. 45, No. 10, p. 2081, (October, 1973).

This paper reviews the strategy developments in water quality surveillance that have occurred in this country. The paper also discusses the importance of data to successful implementation of these strategies and notes failures in the utilization of the data. Remedies for these situations are also proposed.

A-30 Manual on Disposal of Refinery Wastes, Volume on Liquid Wastes, American Petroleum Institute, 1801 K Street, N.W., Washington, D.C. (1969).

This document is a comprehensive manual on the disposal and treatment of petroleum refinery wastes. Included is information on the removal and reduction of pollutants, collection and treatment of wastewaters, monitoring, and solubility and toxicity data.

A-31 Principles of Industrial Waste Treatment, Gurnham, C. Fred, John Wiley & Sons, Inc., New York, New York, (1955), 399 pp.

This book examines the problem of industrial wastes from the unit operations viewpoint. Operations and processes used to treat wastes before discharge include physical, chemical and biological pretreatment. Sources of wastes, their pollutional effects and a review of major industry problems are covered.

A-32 Industrial Waste Treatment Practice, Eldridge, E. F., McGraw-Hill Book Company, Inc., New York, New York, (1942), 401 pp.

Information and data pertaining to the design and operation of treatment works for industrial wastewaters are given. Wastewaters from important industries are characterized.

A-33 Choosing the Optimum Financial Strategy, Upgrading Meat Packing Facilities to Reduce Pollution, U.S. EPA Technology Transfer Seminar Publication, October, 1973, 38 pp.

This booklet presents various strategies for financing pollution control equipment. The areas covered include depreciation, State and other financing, tax incentives, and comparisons between on-site and municipal treatment. Three hypothetical meat packing facilities are considered as examples, and their method of optimizing costs are detailed.

A-34 In Process Modifications and Pretreatment, Upgrading Meat Packing Facilities to Reduce Pollution, U.S. EPA, October, 1973, 90 pp.

Methods of reducing pollution from meat packing plants are described in this report. Both in-plant modifications and pretreatment of wastes are discussed. Two case histories are presented, with operating results. A discussion of odor problems and control is also included.

A-35 Waste Treatment, Upgrading Meat Packing Facilities to Reduce Pollution, U.S. EPA, October, 1973, 64 pp.

This booklet describes the use of biological wastewater treatment methods to treat waste from meat packing plants. The various biological systems are indicated, and procedures for planning, designing and constructing such facilities are recommended. Proper operation and maintenance procedures are presented, and case histories of several plants utilizing biological treatment are detailed.

A-36 In-Plant Control of Pollution, Upgrading Textile Operations to Reduce Pollution, U.S. EPA Technology Transfer Seminar Publication, October, 1974, 118 pp.

This study surveys the wastes produced by textile operations and indicates various treatment methods to reduce and eliminate pollution. Examples of flow reduction, water reuse and waste segregation are presented. Different pretreatment techniques are also discussed.

A-37 Wastewater Treatment Systems, Upgrading Textile Operations to Reduce Pollution, U.S. EPA, October, 1974, 45 pp.

Experience with using biological treatment systems and activated carbon to treat textile wastes is described in this bulletin. The sources and strengths of wastewaters from various textile manufacturing processes are described, and case histories from several plants are indicated.

A-38 In-Process Pollution Abatement, Upgrading Metal Finishing Facilities to Reduce Pollution, U.S. EPA, July, 1973, 69 pp.

This booklet describes generally the metal finishing industry and techniques that can be used to control pollution. One chapter deals specifically with water pollution, and discusses both conservation and treatment.

A-39 Waste Treatment, Upgrading Metal Finishing Facilities to Reduce Pollution, U.S. EPA, July, 1973, 47 pp.

Methods of treating metal-finishing wastes are discussed in this document. Methods of process solution regeneration and recovery are indicated and commonly used waste treatment systems are also described. A chapter on solid-liquid separation, solids concentration and sludge disposal is included. The economic considerations of waste treatment are outlined.

A-40 Upgrading Poultry Processing Facilities to Reduce Pollution, Volume 1 - In-Process Pollution Abatement, Volume 2 - Pretreatment of Poultry Processing Wastes, Volume 3 - Waste Treatment, U.S. EPA Technology Transfer Seminar Publication, June, 1973.

This three volume set of booklets describes methods of reducing and treating the wastes from poultry processing operations. The first volume describes the industry and its wastes, and presents a case study of process and equipment modifications which were successful in reducing wastewater. The second booklet discusses unit operations which may be used as pretreatment of poultry wastes. The relationship of municipal ordinances and these wastes is also indicated. The third volume discusses complete waste treatment, including planning, selection and operating suggestions. A case history of a waste treatment plant for poultry wastes is included.

A-41 Technical Aspects of Joint Waste Treatment, Municipal/Industrial, Litsky, W., et.al. editor, Proceedings of an Institute Held at Framingham, Massachusetts, March 5, 1969, Technical Guidance Center for Industrial Water Pollution Control (University of Massachusetts) and Associated Industries of Massachusetts.

This document is a collection of papers dealing with the organizational, managerial and technical aspects of joint industry/municipal sewage treatment. Some of the subjects included are economic studies of joint treatment and case histories of combined treatment. 15 technical papers are included.

For additional information pertaining to this section, please refer to the following articles:

E-31
E-66
E-73
D-112

SECTION B - MANAGEMENT OF A CONTROL PROGRAM

Reference: Volume I - Section B

B-1 "Delaware System Moves Ahead," Webber, Paul J. and Robert C. Kausch, Water and Wastes Engineering, p. 44, January, 1972.

This article describes how the Delaware River Basin Commission set up a regional waste treatment system in cooperation with the local municipalities and industries. The article describes the history, starting from the original agreement, through the pilot plant to the beginning of the final plans.

B-2 "Classifying Industrial Wastewater Emissions," Williams, Rodney T., Water and Sewage Works, Vol. 121, No. 7, p. 86, (July, 1974).

This article describes the classification methodology of the East Bay Municipal Utility District, Oakland, California to categorize the industrial users of their system. The article describes the classification program, the rate structure, the regulations and permits used.

B-3 "Pollution Abatement Thru Government-Corporate Cooperation," Reed, Paul E., Water and Sewage Works, Vol. 121, No. 9, p. 104, (September, 1974).

This article describes the managerial, fiscal, and political aspects of the Joint Treatment Facility between the Borough of Naugatuck, Connecticut and Uniroyal, Inc. The Naugatuck Treatment Company, which is owned by Uniroyal, Inc. will run the plant. The financial considerations of this arrangement are described.

B-4 "Chicago Industrial Waste Surcharge Ordinance," Anderson, Norval E. and Ben Sosewitz, Journal of the Water Pollution Control Federation, Vol. 43, No. 8, p. 1591, (August, 1971).

This article first describes in detail the surcharge program, and then includes a copy of the ordinance used by the Metropolitan Sanitary District of Greater Chicago.

B-5 "The Joint Municipal and Industrial Wastewater Treatment Approach - A Case History," Hickman, Paul T., Presented at the Water Pollution Control Federation Meeting, Denver, Colorado, October 9, 1974.

This paper presents a case history of the Joint Municipal and Industrial approach to water pollution control, practiced in the City of Springfield, Missouri. The article describes the collection system, treatment plants, and the history of the surcharge system.

B-6 "All Parties Can Benefit from Joint Municipal-Industry Treatment," Byrd, J. Floyd, Water and Sewage Works, Volume 116, No. 11, p. IW 14, November, 1969.

This article lists the advantages of joint treatment as opposed to separate industrial treatment. A number of specific cases are presented to support these claims. Factors affecting the development of a good ordinance are also listed.

B-7 "Methods of Charging for the Reception, Treatment and Disposal of Toxic Wastes," Harkness, N., Water Pollution Control, Vol. 69,(1970).

This article presents methods of calculating the costs of (and the charges for) treating toxic wastes mixed with sewage. Different methods are presented for different types of wastes to be treated.

B-8 "Technical Bases for Assessing the Strength, Charges for Treatment and Treatability of Trade Wastes," Simpson, James R., Water Pollution Control, Vol. 66, No. 2, p. 165,(1967).

This article presents a detailed methodology, with formulas, for determining the strength, and charges for treatment of industrial wastes in publicly owned treatment works.

B-9 "Rx for Industry: Regionalism," Traquair, William C., Water and Wastes Engineering, May, 1973.

This article states the reasons for choosing joint treatment in Concord, N.H., and describes the treatment system used.

B-10 "Cooperation Helps Erie," Waytenick, Robert J., Water and Wastes Engineering, September, 1973, p. 76.

This article describes the agreement between Erie, Pennsylvania and the Hammermill Paper Company for a joint waste treatment system. A description of the treatment plant is also presented.

B-11 "Estimating Industrial Water Pollution in Small Regions," Greenberg, Michael R. and Rae Zimmerman, Journal of the Water Pollution Control Federation, Vol. 45, No. 3, p. 462, (March, 1973).

This article describes the methodology used to develop a model for estimating the volume and quality of industrial effluents. The model was developed for the New York Metropolitan region, consisting of 21 counties.

B-12 Enforcement Management System Users Guide, U.S. E.P.A., NTIS No. PB 210 716, 210 pp., September, 1972.

The Enforcement Management System (EMS) was developed to aid our pollution control agencies handle data arising from most agency enforcement activities. The system emphasizes management control of enforcement functions and establishes standardized methods of handling data.

B-13 "Industrial Waste Charges," Seagraves, James A., Journal of the Environmental Engineering Division, ASCE Vol. 99, No. EE 6, p. 873, (December, 1973).

The controversial issues involved in establishing equitable industrial charges for wastewater discharges are discussed. Included are several examples of existing surcharge methods.

B-14 "Combined Treatment," Byrd, J. F., Proceedings of the 16th Industrial Waste Conference, Purdue University, (1961), p. 92.

The advantages and limitations of combined municipal-industrial sewage treatment are discussed. Several methods of recovering costs are also reviewed.

B-15 "Potential of Large Metropolitan Sewers for Disposal of Industrial Wastes," Gibbs, Charles V. and Ray H. Bothel, Journal of the Water Pollution Control Federation, Vol 37, No. 10, p. 1417, (October, 1965).

The advantages to industry of locating in a large metropolitan area to benefit from joint treatment of industrial wastes are discussed. The discussion includes the relative financial, personnel, technical and treatability aspects of sewage treatment.

B-16 "Development of an Industrial Waste Study for a Municipality," Meers, J. E., et al, Journal of the Water Pollution Control Federation, Vol. 36, No. 12, p. 1501, (December, 1964).

A survey was conducted to develop a comprehensive sewerage plan for the Bloom Township Sanitary District, Chicago Heights, Illinois. The objectives of the study were to identify wastewater constituents that interfere with treatment works, to determine the extent that the present facilities could be utilized, and to evaluate the present sewer use ordinance.

B-17 "An Industry Approach to Pollution Abatement," Rocheleau, R.F., and E. F. Taylor, Journal of the Water Pollution Control Federation, Vol. 36, No. 10, p. 1185, (October, 1964).

The factors necessary to implement an effective industrial waste management program are discussed. Control methods and techniques are also described and economic considerations are stressed.

B-18 "New Concepts in Industrial Sewage Collection," Munson, Edward D., Journal of the Water Pollution Control Federation, Vol. 36, No. 9, p. 1146, (September, 1964).

This article discusses the segregation of industrial wastes and their conveyance through open channels as a means of wastewater collection and treatment. The Bayport, Texas industrial sewerage plan is also described.

B-19 "Combined Treatment - A Coast to Coast Coverage," Byrd, J. Floyd, Journal of the Water Pollution Control Federation, Vol. 39, No. 4, p. 601, (April, 1967).

This article discusses factors that can contribute to the failure or success of combined industrial and municipal wastewater treatment systems. The advantages of performance and cost of joint treatment are examined. Precautions necessary to assure success are also outlined.

B-20 "Combined Treatment at Kalamazoo - Cooperation in Action," Swets, Donald H., et al, Journal of the Water Pollution Control Federation, Vol. 39, No. 2, p. 204, (February, 1967).

This article describes the steps which led to the establishment of a government and industry joint wastewater treatment system. Some of the philosophies that shaped the venture, and how the program evolved and was implemented are discussed. Points of view are presented by representatives of each of the affected institutions: public works director, industry, city and state.

B-21 "Evaluation Factors for Joint Waste Treatment," Reiter, W.M., Pollution Engineering, Vol. 6, No. 12, p. 38, (December, 1974).

This article contains a general discussion on the factors that need to be considered in a joint municipal-industrial waste treatment program. Factors include waste treatability; federal, state and municipal regulations; pretreatment requirements; and cost and extent of monitoring and surveillance.

B-22 "Planning and Execution of Industrial Waste Treatability Studies," Westfield, James D., et al, Proceedings of the 26th Industrial Waste Conference, Purdue University, (1971), p. 832.

This paper presents an approach to planning a treatability study. The approach defines a framework which can be used to plan and conduct any industrial waste treatability evaluation. Treatment processes can then be selected to satisfy required removals.

B-23 "The Foundation of Successful Industrial Waste Disposal to Municipal Sewage Works," Wisely, W.H., Proceedings of the 5th Industrial Waste Conference, Purdue University, (1949), p. 360.

Factors leading to successful joint (municipal and industrial) sewage treatment relationships are discussed. Some of the common causes for breakdown in these arrangements are outlined.

B-24 "Management of Industrial Effluent Disposal in Britain," Jackson, C. J., Journal of the Water Pollution Control Federation, Vol. 41, No. 12, p. 2020,(December, 1969).

This article discusses the wastewater treatment and disposal factors to be considered in making industrial planning decisions. Factors discussed include treatment and disposal methods, pretreatment requirements, and costs.

B-25 "Planning Industrial Waste Treatment," Black, H. H., Journal of the Water Pollution Control Federation, Vol. 41, No. 7, p. 1277,(July,1969).

This article presents those concepts that may serve as guidelines for those engaged in the planning of industrial waste treatment. Factors that must be considered for effective planning are discussed, including evaluation of waste load and receiving waters, treatment requirements, development of design criteria, and monitoring.

B-26 "Treatment of Mixed Industrial Wastes at Bayport's Industrial Complex", Meriwether, George B., Journal of the Water Pollution Control Federation, Vol. 41, No. 3, p. 440, (March, 1969).

The central wastewater collection and treatment system for the Bayport industrial complex is described. Pretreatment requirements, management of the program and the system of user charges are also discussed.

B-27 "How to Manage Industrial Inflow," Williams, R. T. and R. J. Dolan, Water and Sewage Works, Vol. 121, No. 12, p. 46, (December, 1974).

The development of a wastewater management plan for the East Bay Municipal Utility District, Oakland, California is reported. The discussion includes ordinance development, sampling program, service charges, and permit programs.

B-28 "The Advantages of Industrial-Municipal Wastewater Treatment," Watson, K. S., Journal of the Water Pollution Control Federation, Vol. 42, No. 2, p. 209, (February, 1970).

This article discusses the advantages of joint treatment, and indicates the different approaches that a sanitary district can take. Case histories are discussed, such as the Los Angeles County Sanitation Districts, Allegheny County, and the Metropolitan Sewer District of Greater Chicago. An equitable finance formula is also discussed.

B-29 "Industrial Effluents: Problems of Recovering Costs," Lewin, V. H., Discharge of Industrial Effluents to Municipal Sewerage Systems, p. 77, Proceedings of Symposium of the Institute of Water Pollution Control, London. November 29-30, 1971.

This paper discusses several systems now in use in England and Wales to recover the costs of industrial sewage treatment. Some of the problems involved are also discussed. The experiences of the City of Oxford, which has been using a Mogden-type formula for cost recovery, are reported.

B-30 "Methods of Charging for the Treatment and Disposal of Industrial Effluents in Municipal Sewerage Systems," Simpson, J. R. and G. A. Truesdale, Discharge of Industrial Effluents to Municipal Sewerage Systems, p. 65, Proceedings of Symposium of the Institute of Water Pollution Control, London. November 29-30, 1971.

A method to calculate user charges for industrial effluents is presented. A charge for both the capital and operating costs is recommended. Calculations for capital costs are based upon sewerage system design; operating costs are based upon quantity and character of flow. Formulae to make these calculations, and several examples of their implementation are also included.

B-31 "Present Industrial Effluent Legislation and Its Short-Comings," Fisher, N. S., Discharge of Industrial Effluents to Municipal Sewerage Systems, p. 14, Proceedings of Symposium of the Institute of Water Pollution Control, London, November 29-30, 1971.

This paper reviews British law pertaining to the discharge of trade effluents and comments on some of the shortcomings of its provisions. Several views are presented on where the responsibility for water quality control should be.

B-32 "Effects of the 1972 Water Pollution Control Act Amendments on Industrial Waste Monitoring in Anondaga County," Ott, Randy, et al, presented at the New York Water Pollution Control Association, January, 1974.

An extensive analysis program was conducted to estimate industry's proportionate cost of wastewater treatment. A discussion of cost of such a program, data collection, and results of the program are presented in this paper.

For additional information pertaining to this section, please refer to the following articles:

D-3
D-12
D-29
D-34
D-42
D-76
D-114

E-15
E-16
E-28

SECTION C - LEGAL ASPECTS OF A CONTROL PROGRAM

Reference: Volume I - Section C

C-1 "Wastes May Not Be a Treat for Pretreatment," Chemical Week, October 9, 1974.

This article discusses the disadvantages of pretreatment for organic chemical manufacturing plants. The disadvantages discussed include economic, technical and political considerations.

C-2 "The Sewer Ordinance Basics," Calver, Robert and Trevor Saxon, Water and Sewage Works, Vol. 121, No. 8, p. 54, (August, 1974).

The fundamentals of wastewater control are discussed, including the need for an industrial sewer ordinance. Recommendation for planning and designing the ordinance are also included and user charge formulas are presented.

C-3 "Regulations and Service Charges for the Treatment of Industrial Wastewater in Federally Assisted Public Facilities," Gutierrez, A. F., Paper presented to the Southeast Section Convention of the American Waterworks Association, San Antonio, Texas, October 11, 1971.

The importance of adopting a community ordinance to control and regulate the use of public wastewater facilities, to protect these facilities and to provide an equitable system of cost recovery is discussed. Included is a cost recovery formula and several examples which illustrate its use.

C-4 "Energetic Enforcement of Industrial Waste Ordinances," Lavin, Allen, Proceedings of the 23rd Industrial Waste Conference, Purdue University, p. 550, 1968.

This paper discusses why industrial waste ordinances have been failing, and how the Metropolitan Sanitary District of Greater Chicago is enforcing theirs. The author also presents arguments for strict enforcement of industrial waste ordinances.

C-5 "Municipal Waste Ordinances - The Views of Industry," Byrd, J. F., Journal of the Water Pollution Control Federation, Vol. 37, No. 12, p. 1635,(December, 1965).

The views of industry are presented on what constitutes a good municipal waste ordinance. The discussion centers on those aspects of the model ordinance, presented in Water Pollution Control Federation's Manual of Practice #3, "Regulation of Sewer Use,", which are of interest to industry.

C-6 Development of a State Effluent Charge System, U.S. E.P.A., NTIS No. PB 210 711, 215 pp., February, 1972.

The Vermont permit and fee system that has been developed and implemented is described in this book. Various methods of fee calculations are discussed and the reasons for selection of one are set forth. The following issues are discussed: incentive effect on dischargers, the relation of dischargers to instream economic damages, equity, constitutionality, economic efficiency, technical and administrative feasibility and income potential.

C-7 "Effluent Guidlines - Industry's Point of View," Elkin, Harold F, et al, Pollution Engineering, Vol. 20, No. 6, p. 18,(November-December, 1974).

This article examines industry's view toward the development and use of effluent guidelines for industrial discharges to navigable waters. It presents a case history of the development of petroleum refining discharge guidelines.

C-8 "Chicago vs. Industry Polluters," Lue-Hing, Cecil, and Earl W. Knight, Water and Wastes Engineering, p. 71, September, 1973.

This article briefly discusses the water pollution problem caused by industries discharging to the Metropolitan Sanitary District (MSD) of Greater Chicago and the actions taken by the MSD to correct these problems.

C-9 "Some Experiences in the Pretreatment of Industrial Waste Going to the Municipal Sewer System of Philadelphia," Reich, J. S., Proceedings of the 10th Industrial Waste Conference, Purdue University, (1955), p. 244.

The pretreatment and disposal practices of several types of industries discharging to the Philadelphia treatment system are discussed. The city has established a set of criteria upon which pretreatment requirements are based.

C-10 "Control of Industrial Wastes Entering Municipal Sewers," Carpenter, Carl B., Proceedings of the 11th Industrial Waste Conference, Purdue University, (1956), p. 1.

This article presents the experiences of the Hammond Sanitary District's monitoring and ordinance program. The article describes its monitoring system to catch illegal dischargers. Case histories dealing with problem wastes from industry are also presented. These case histories deal with such items as waste streams containing spent pickle liquors,oil spills, and sulfuric acid plant wastes.

C-11 "Establishing Industrial Waste Ordinances," Taylor, Dean M., Proceedings of the 10th Industrial Waste Conference, Purdue University, (1955), p. 255.

This paper discusses the basic requirements which should be recognized in preparation of an industrial wastewater ordinance. Factors to be considered include a clear definition of terms, conditions for usage of the public sewers, prohibitions of specific substances, monitoring requirements, penalties and charges.

C-12 "Experience with Waste Ordinance and Surcharges at Greensboro, North Carolina," Shaw, Ray E., Jr., Journal of the Water Pollution Control Federation, Vol. 42, No. 1, p. 44,(January, 1970.)

This article is a case history of how an ordinance system was developed in the City of Greensboro, North Carolina. The article includes discussions on the ordinance structure, the method of establishing the surcharge, the sampling procedures, and presents several case histories.

C-13 "Factors in the Development of an Industrial Waste Ordinance," Hamlin, W.G., Proceedings of the 9th Industrial Waste Conference, Purdue University, (1954), p. 14.

This article discusses some of the many factors which must be considered before drafting an adequate industrial waste ordinance. Factors to be considered include: statement of purpose and policy, definition of terms, definition of public sewer usage, prohibition of specific substances, conditions of industrial waste discharge, industrial waste charges, refunds, penalties and validation.

C-14 "Pretreatment Requirements for Industrial Waste Discharged to Municipal Treatment Systems," Escher, Dennis E. and Andrew J. Kicinski, presented at the ASCE-EED Specialty Conference on Environmental Engineering Research, Development and Design, Pennsylvania State University. July, 1974.

This paper considers the subject of developing criteria for the pretreatment of industrial wastes prior to their discharge into municipal sewage treatment systems. The article presents a detailed discussion of the 1972 amendments to the Federal Water Pollution Control Act, including requirements and interpretations. The paper also discusses some recommended effluent limitations for pretreatment.

C-15 "Consents and Agreements," Finch, John, Discharge of Industrial Effluents to Municipal Sewerage Systems, Proceedings of Symposium of The Institute of Water Pollution Control, London, p. 23, November 29-30, 1971.

Legal aspects of implementing the Acts of Parliament pertaining to wastewater treatment are discussed. Included are several model agreements, which contain regulations establishing effluent limitations, financial arrangements and management control programs.

C-16 "MOP No. 3 Regulation of Sewer Use", Journal of the Water Pollution Control Federation.

Part I - Vol. 45, No. 9, p. 1985 (September, 1973)
Part II- Vol. 45,No. 10, p. 2216 (October, 1973)

This manual of practice has been prepared to assist municipalities regulate and control wastewater facilities. The importance of controlling usage is emphasized. The fundamental requirements of the regulations that are essential to proper control are indicated. The effects of inadequate control, and considerations in developing a code and ordinance, are also discussed. The second part of this manual presents and discusses a model ordinance for wastewater control. Charges for wastewater service are indicated and recommendations to implement the ordinance are made.

C-17 "Heavy Metals in Digesters: Failure and Cure," Regan, Terry M. and Mercer Peters, Journal of the Water Pollution Control Federation, Vol. 42, No. 10, p. 1832 (October, 1970), also reported in Proceedings of the 25th Industrial Waste Conference, Purdue University, (1970), p. 645.

This article reports the action taken after primary digester failure at the Lexington, Kentucky treatment plant. The failure was caused by excessive metal concentrations. The costs incurred from this failure are also presented. The waste sampling system that was subsequently instituted is described.

C-18 Metropolitan Sewerage System, Seattle, Washington. Resolution No. 2158. Regarding the Control and Disposal of Industrial Waste into the Metropolitan Sewerage System, July, 1974.

C-19 City of Atlanta, Georgia

a. Sewer Service Charges and Industrial Waste Surcharges, 1971.

b. Standards of Acceptability of Industrial or Trade Wastes for Admission into Sewers of the City of Atlanta, Georgia, 1971.

C-20 Metropolitan Sewer Board, St. Paul, Minnesota, Sewage and Waste Control Rules and Regulations for the Metropolitan Disposal System, December 1, 1971.

C-21 The Sanitary District of Rockford, Illinois, Ordinance No. 309, Pollutant Discharge Control Ordinance of the Sanitary District of Rockford, 1974.

C-22 City of New York, New York

a. Rules and Regulations Relating to the Use of the Public Sewer System for the Discharge of Sewage, Industrial Waste and Other Wastes, Including Surcharges and Penalties.

b. Amendment to the Administrative Code, Section 687-1.0 Industrial Waste; Sewer Surcharges.

C-23 City of Houston, Texas, Disposal of Industrial Waste Through City Sewer System, 1974.

C-24 Metropolitan Sewer District of Greater Cincinnati, Cincinnati, Ohio, Rules and Regulations, December 4, 1968.

C-25 Commission of Jefferson County, Jefferson County, Alabama

  a. Rules and Regulations for Discharge of Waste Into Sanitary Sewerage System, April, 1970.

  b. Resolution for Industrial Waste Surcharge, September, 1972.

C-26 The Metropolitan St. Louis Sewer District, St. Louis, Missouri

  a. Ordinance No. 2289, May, 1972

  b. Ordinance No. 2412, March, 1973

  c. Ordinance No. 2444, June, 1973

C-27 City of Akron, Ohio, Ordinance No. 499, Industrial Wastes; Regulations for Non-acceptable, 1963.

C-28 City of Dallas, Texas, Industrial Waste Ordinance, 1969.

C-29 City of Topeka, Kansas, Ordinance No. 13664, 1975.

C-30 City of Fitchburg, Massachusetts, The Discharge of Waters and Wastes Into the Public Sewer System.

C-31 Westchester County Environmental Facilities, Westchester County, New York, Sewer Ordinance No. 1, Rules, Regulations and Ordinances Governing the Discharge of Sewage, Industrial Wastes or Other Wastes.

C-32 City of Olean, New York, Sewer Use Ordinance, September, 1968.

C-33 Township of Towamencin, Pennsylvania, Rates, Rules and Regulations, April, 1967.

C-34 City of Muncie, Indiana, Muncie Code of Ordinances; Laws Pertaining to This Division, 1954-1967.

C-35 Sewer Utility of the City of Boulder, Boulder, Colorado, Ordinance No. 3836.

C-36 Environmental Improvement Agency of New Mexico, Santa Fe, New Mexico, Industrial Waste Ordinance, a model ordinance.

C-37 County of Onondaga, Syracuse, New York, Rules and Regulations Relating to the Use of the Public Sewer System, 1972.

C-38 The Metropolitan Sanitary District of Greater Chicago, Chicago, Illinois
   a. Sewage and Waste Control Ordinance as Amended, 1972.
   b. Sewer Permit Ordinance, 1969, Amended, 1972.
   c. Industrial Waste Division Procedural Manual.

C-39 Texas Water Quality Board, Austin, Texas, A Suggested Industrial Waste Ordinance.

C-40 City of Wichita, Kansas
   a. Title 16, Sewers, Sewage Disposal and Drains, 1964
   b. An Ordinance Amending Sections of the Code

C-41 State of Vermont, Suggested Model Sewer Use Ordinance, January, 1975.

C-42 California Water Pollution Control Association, Berkeley, California
   a. Model Wastewater Discharge Permit Application Questionnaire, October, 1974.
   b. Model Wastewater Discharge Ordinance, April, 1974.

C-43 State of Massachusetts, Suggested Rules and Regulations Regarding the Use of Common Sewers, 1974.

C-44 City of Wilmington, Delaware, Exclusion of Materials Detrimental to the Sewerage System

C-45 Buffalo Sewer Authority, Buffalo, New York, Sewer Regulations of the Buffalo Sewer Authority.

C-46 East Bay Municipal Utility District, Oakland, California

- a. Ordinance No. 27, Waste Water Control Ordinance, 1972
- b. Wastewater Discharge Permit Parts A-G

C-47 Sanitation Districts of Los Angeles County, Los Angeles, California

- a. An Ordinance Regulating Sewer Construction, Sewer Use and Industrial Wastewater Discharges, April, 1972.
- b. Instructions for Obtaining a Permit for Industrial Wastewater Discharge
- c. Instructions for Filing an Industrial Wastewater Treatment Surcharge Statement
- d. Industrial Wastewater Charge Rates, 1971
- e. Technical Report - Waste Discharge to the Ocean

C-48 "Pretreatment Requirements for Industrial Wastes Discharged to Municipal Treatment Systems," Escher, E.D., and Kicinski, A.J., ASCE-EED Specialty Conference on Environmental Engineering Research, Development and Design, Penn State University.

Results of a study of the ordinances of 100 geographically distributed municipalities are presented. Ordinance status is covered along with ranges of limitations on certain pollutants as established by the ordinances in force.

For additional information pertaining to this section, please refer to the following articles:

B-4
B-10
B-20
B-21
B-23
B-27
B-31

D-112

F-16
F-41

SECTION D - MONITORING

Reference: Volume I-Section D
Volume II - Appendix 3

D-1 "The Need for, and Methods of, Monitoring and Control of Industrial Discharges to Sewers," Wrigley, K. J. and F. Ashworth, Discharge of Industrial Effluents to Municipal Sewerage Systems, p. 91, Proceedings of the Symposium of the Institute of Water Pollution Control, London, (Nov. 29-30, 1971).

Several aspects of monitoring trade wastes are discussed including regulatory control, instrumental methods of analysis, and qualifications of personnel. The monitoring system used in Manchester for the past ten years is discussed.

D-2 "Self-Contained Sampling and Measurement System Features Respirometer," Robert Shaw Controls, Water and Sewage Works, Vol. 121, No. 2, p. 53 (February, 1974).

This article discusses a self-contained sampling and measurement system which measures oxygen utilized to determine BOD. The sampler aerates the effluent sample and measures the DO before and after. Response time is 2 minutes.

D-3 "Make Water Pollution Control a Meaningful Local Responsibility," Craddock, John M., The American City, May, 1974, p. 63.

This article discusses the procedure used by the Division of Water Quality of the Muncie, Indiana Sanitary District to monitor industrial and commercial wastewaters within their jurisdiction. Automatic samplers are placed on discharges to the sanitary sewer system, which permit monitoring for metals, BOD_5, COD and suspended solids.

D-4 "Instrumentation for Measurement of Wastewater Flow," Nedved, Thomas K. et al, Journal of the Water Pollution Control Federation, Vol. 44, No. 5, p. 820 (May, 1972).

A new instrument has been developed, which measures both stream flow and its characteristics. The device is portable, self-contained, and independent of outside power sources. The system takes a stream sample after a preset flow volume has passed. The instrument is identified and described in this article.

D-5 "Polarographic Method for Nitrate and Dissolved Oxygen Analysis," Hwang, C. P. and C. R. Forsberg, Water and Sewage Works, Vol. 120, No. 4, p. 71, (April, 1973).

This article discusses the disadvantages of the common methods for measuring nitrates and dissolved oxygen. The article then describes a test utilizing a polarographic apparatus with a rapid dropping electrode. The test results are presented.

D-6 "A Rapid Biochemical Oxygen Demand Test Suitable for Operational Control," Mullis, Michael K. and Edward D. Schroeder, Journal of the Water Pollution Control Federation, Vol. 43, No. 2, p. 209 (February, 1971).

A method to determine the total biological oxygen demand of soluble wastes using the chemical oxygen demand test and a mass culture of cells is presented in this article. Experimental and operational data are both presented. A method to shorten the time required to determine BOD is discussed.

D-7 "The Use of Collaborative Studies to Evaluate Water Analysis Instruments," McFarren, Earl F. and Raymond J. Lishka, Journal of the Water Pollution Federation, Vol. 43, p. 67 (January, 1971).

A collaborative study has been indicated as a method to obtain objective evaluation of measurement instruments in laboratories. Studies of fluorides, pesticides, metals and nutrients in water were conducted by the Analytical Reference Service. These collaborative studies are analyzed, and the reliability of various instruments is presented.

D-8 "Total Phosphorus Analysis: Persulfate on Ashing?" Gupta, Kailash B. and Alphonse E. Zanoni, Water and Sewage Works, Vol. 121, No. 7, p. 74 (July, 1974).

This article describes two methods for total phosphorus analysis, the persulfate oxidation and the dry ashing method. The article presents analytical procedures for both methods, and examples of tests on natural water samples are included. Comparisons of the two tests are presented and discussed.

D-9 "Metals in Sewage Measured Simply but Accurately," The American City, August, 1972, p. 40

This article describes how the laboratory at the Irwin Creek Wastewater Treatment Plant in Charlotte, North Carolina uses an atomic absorption spectrophotometer to monitor metal elements.

D-10 "Laboratory Tests for Plant Operation Control and Stream Quality Measurement," Banerji, Shankha K., Journal of the Water Pollution Control Federation, Vol. 43, No. 3, p. 399 (March 1971).

A number of water quality tests including those for BOD, COD, TOC, total oxygen demand, suspended solids, sludge volume index and oxidation - reduction potential are discussed in this article. The advantages and disadvantages of each test are also discussed.

D-11 "Gauging and Sampling Industrial Wastewater (Open Channel)," Klein, Larry A. and Albert Montague, Journal of the Water Pollution Control Federation, Vol. 42, No. 8, p. 1468 (August, 1970).

The gauging and sampling system developed by New York City to measure industrial discharge to the sewer system is presented in this article. The methods utilized are applicable to open channels.
The methods described include: an inflatable gas bag and portable ejector system for in-plant gauging; and a combination V-notch weir or flume with a head measuring device and a propeller meter for out-of-plant measurements.

D-12 "Routine Surveillance Alternatives for Water Quality Management," Ward, Robert C., Journal of the Water Pollution Control Federation, Vol. 46, No. 12, p. 2645 (December, 1974).

Grab sampling, automatic monitoring, and remote sensing are reviewed in this paper. Their individual and collective roles in the overall design of a routine water quality surveillance program are discussed.

D-13 "Portable Device to Measure Industrial Wastewater Flow," Forester, R. and D. Overland, Journal of the Water Pollution Control Federation, Vol. 46, No. 4, p. 777 (April, 1974).

This paper describes a method of monitoring the wastewater pumps in a sewage treatment plant to record the pump's operating time. The paper indicates how this defines both the total flow and the flow during any period of time. This data can compliment automatic samplers in obtaining accurate wastewater measurements.

D-14 "Carbon Measurements in Water Quality Monitoring," Maier, Walter J. and Hugh L. McConnell, Journal of the Water Pollution Control Federation, Vol. 46, No. 4, p. 623 (April, 1974).

This article discusses the use of a carbon analyzer to test natural waters in Minnesota. The results of an extensive test program are presented. The program tested the organic and inorganic carbon content of the waterways, various equipment, and the correlations between BOD/TOC and COD/TOC ratios.

D-15 "Comparison of Wastewater Sampling Techniques," Tarazi, D. S. et. al., Journal of the Water Pollution Control Federation, Vol. 42, No. 5, p. 708, (May, 1970).

The results of a study comparing two sampling techniques is presented. One technique uses grab samples and the other composite samples. The tests were run on two separate outfalls and results of the tests are indicated.

D-16 "Evaluation of an Automatic Chemical Analysis Monitor for Water Quality Paramaters," O'Brien, James E. and Rolf A. Olsen, Journal of the Water Pollution Control Federation, Vol. 42, No. 3, p. 380, (March, 1970).

This article evaluates an automatic water monitoring unit with 12 channels to measure: Nitrate, Nitrite, Alkalinity-pH 8.3, Alkalinity-pH 4.6, Phenol, Free Ammonia, Sulfate, Phosphate, Iron (Fe), COD, Methylene Blue Active Substance, and Fluoride. The test site was on the Hudson River, 3 miles south of Albany, New York. Operational problems of the unit are discussed. Modifications to the unit in attempts to overcome some problems are discussed,and factors which must be taken into consideration in the design of an automatic system are reported.

D-17 "The Detection of Organic Pollution by Automated COD," Molof, A. H. and N. S. Zaleiko, Proceeding of the 19th Industrial Waste Conference, Purdue University (1964), p.540.

This paper presents the results of experimental work to convert the manual COD test as outlined in Standard Methods to an automated chemical test. The test consists of using a colorimeter to measure the Hexavalent Chromium present after the oxidation steps. Laboratory and field test results are both given.

D-18 "An automated BOD Respirometer," Arthur, Robert M., Proceedings of the 19th Industrial Waste Conference, Purdue University, (1964), p. 628.

This paper describes an automatic instrument which measures BOD utilizing the partial pressure of oxygen over a sample with the use of a manometer.

D-19 "A Colorimetric Method for Determining Chemical Oxygen Demand," Gaudy, A. F. and M. Ramanathan, Proceedings of the 19th Industrial Waste Conference, Purdue University (1964), p. 915

The purpose of the experiments reported in this article was to determine whether COD values obtained by the standard titrimetric procedure were equivalent to those obtained colorimetrically when identical samples were subjected to identical reflux conditions. Tests were conducted on municipal, industrial, and joint wastes. Laboratory tests on a standard compound were also included.

D-20 "The Determination of Total Organic Carbon in Water," Larson, T. E. et. al., Proceedings of the 19th Industrial Waste Conference, Purdue University (1964), p. 762.

This paper discusses one method for measuring the carbon dioxide process by the TOC test, which uses Van Slyke reagent. Laboratory test results are presented and discussed.

D-21 "Characterization of Industrial Wastes by Instrumental Analysis," Clark, H. A. Proceedings of the 23rd Industrial Waste Conference, Purdue University (1967) p. 26.

This paper presents a general discussion of a large laboratory in Toronto, and discusses the work functions and equipment available in the laboratory. The use of the instruments (including polarography, atomic adsorption spectrophotometry, and chromatographic methods), and the application of these techniques to industrial wastes is also indicated.

D-22 "A Fluorometric Method for the Determination of Lignin Sulfonates in Natural Waters," Thruston, Alfred D., Jr., Journal of the Water Pollution Control Federation, Vol. 42, No. 8, p. 1551 (August, 1970).

The use of a simple fluorometer for the detection of low concentrations of lignin sulfonate solutions is described in this article. An optical bridge fluorometer was used in experiments which are also described. The limits of fluorescent assay are presented and details of a continuous monitoring system are also indicated.

D-23 "Remote Sensing of Water Pollution," Hom, Leonard W., Journal of the Water Pollution Control Federation, Vol. 40, No. 10, p. 1728 (October, 1968).

The concept and theory of remote sensing are discussed in this article. A discussion of the various factors which govern the remote sensing of water pollution is also included. Different types of remote sensing are discussed and the advantages and limitations of many are presented.

D-24 "Application of the Total Carbon Analyzer for Industrial Wastewater Evaluation," Ford, Davis L., Proceedings of the 23rd Industrial Waste Conference, Purdue University (1968), p. 989.

This article presents information on the correlation of BOD and COD to TOC for various chemicals and for various industrial waste streams (e.g. chemical and petrochemical). Literature was used as the source for the raw data.

D-25 "Identification of Petroleum Products in Water," Lively, L., et al, Proceedings of the 20th Industrial Waste Conference, Purdue University (1965), p. 657.

This paper presents an analytical method to determine petroleum products in water. Specific industrial problems are then used to illustrate the application of these analytical methods.

D-26 "Value of Instrumentation in Wastewater Treatment," Salvatorelli, Joseph, Journal of the Water Pollution Control Federation, Vol. 40, No. 1, p. 101 (January, 1968).

Instrumentation and its application to waste treatment plants is discussed in this article. The types of instrumentation available, the value of instrumentation, the applications of instruments and examples of their use are all discussed.

D-27 "Monitoring and Treatment of Cyanide - Bearing Plating Wastes," Vought, John H., Journal of the Water Pollution Control Federation, Vol. 39, No. 12, p. 1971 (Dec., 1967).

Treatment plant controls, and monitoring equipment at a Motorola plant are described. Their automatic monitoring includes pH and cyanide measurement.

D-28 "Determination of Organics in Water," Andelman, Julian B. et. al., Proceedings of the 20th Industrial Waste Conference, Purdue University (1965) p. 220.

This paper assesses the extent of recoverability of organics when activated carbon is used to remove organics from wastewater. The organics are then extracted from the carbon and measured. Municipal tap water was used as the sample for the experiments.

D-29 "Water Quality Monitoring must be Action-Oriented," Stack, Vernon T., Jr., Water and Waste Engineering, Vol. 8, No. 3, p. 310 (March, 1971).

This article discusses monitoring systems in detail. Problems in their administration (with potential solutions)are indicated, particularly in regard to obtaining representative samples. A review of automatic samplers on the market is also included.

D-30 "Waste Monitoring by Gas Chromatography," Cochran, L. G. and F. D. Bess, Journal of the Water Pollution Control Federation, Vol. 38, No. 12, p. 2002 (Dec., 1966).

The development of gas chromatography and its use at the Institute, West Virginia Plant of Union Carbide Corporation is presented in this article. Gas chromatographs help control organic loadings on the treatment plant, trace abnormal losses of chemicals common to several departments, and evaluate the effectiveness of treatment.

D-31 "A Rapid Wastewater Sensitivity Test," Brown, James A., Jr., Industrial Waste, May/June, 1972, p. 28.

The application of a modified paper disc technique for rapid screening of wastewater is described. Materials that exert a deleterious effect on the physiological function of the microorganisms in activated sludge may be detected by this technique. The test is qualitative, and the details of the technique are presented.

D-32 "Cold Vapor" Method for Determining Mercury," Kopp, John F. et. al., Journal of the American Water Works Association, Vol. 64, p. 20 (Jan., 1972).

This article presents an analytical method for measuring mercury in water. The method was developed in the author's laboratory. An atomic absorption spectrophotometer with auxiliary equipment is required.

D-33 "Mercury Analysis and Toxicity: A Review," Baker, Robert A. and Ming-Dean Luh, Water and Sewage Works, Vol. 118, No. 5, p. IW-21, (May, 1971). (Also included in Industrial Wastes, May/June, 1971)

This article reviews various methods used to measure mercury, both qualitatively and quantitatively. The advantages and disadvantages of each procedure are discussed. The toxicological effects of mercury are also indicated in this article.

D-34 "Monitoring Wastewater? Try these Methods," Churchill, R. J. and T. A. Helbig, Industrial Wastes, September/October 1974, p. 26.

A basic approach to a self-monitoring system is presented in this article. The needs for and methods to obtain representative samples are indicated, and the Federal Guidelines and various analytical methods are reported.

D-35 "A New Technique for Industrial Waste Sampling," Beach, Martha I. and John S. Beach, Jr., Industrial Wastes, January/February, 1973, p. 28.

This article describes a sampling technique called the sequential composite, and compares it to grab samples, simple composites and flow proportioned composites.

D-36 "Atomic Absorption Spectrophotometry Simplifies Heavy-Metals Analysis," Willey, Benjamin F., et. al., Journal of the American Water Works Association, Vol. 64, p. 303, (May, 1972)

This article presents the basic operating principles and procedures for adjusting the instrument settings of an atomic absorption spectrophotometer and precautions concerning its operation. Its application for the analysis of heavy metals is discussed in detail. The article also compares atomic absorption with wet chemical analysis.

D-37 "Rapid Phosphate Determination by Fluorimetry," Guyon, John C. and Wolbur D. Shults, Journal of the American Water Works Association, Vol. 63, p. 403 (August, 1969).

Two similar procedures for determining phosphate concentrations are discussed. One method is suitable for lower concentrations and the second for higher levels. The elimination of interferences of cations and anions is also discussed. The apparatus, reagents and procedures to be used and the effects of certain variables are presented.

D-38 "Detection and Monitoring of Phenolic Wastewater," McRae, A. D. et. al., Proceedings of the 14th Industrial Waste Conference, Purdue University, (1959).

This paper describes the modifications made to an instrument which used a nitrous acid-mercuric nitrate reagent (millions Reagent) to monitor phenols. Modifications included a water softener, buffering agent and indolac reagent. The modifications were made on an instrument which monitored the effluent from the Imperial Oil Limited Oil Refinery in Sarnia, Ontario, Canada.

D-39 "Polarographic Scanning of Industrial Waste Samples," Porter, J. D. and W. W. Sanderson, Proceedings of the 9th Industrial Waste Conference, Purdue University (1954).

A method of screening water samples to determine which metals are present is reported. The advantage of this screening is to eliminate analyzing for metals which are not present. A detailed description of the equipment and the procedure of the tests is given.

D-40 "New, Simplified Methods for Metal Analysis," McFarren, Earl F., Journal of the American Water Works Association, Vol. 64, p. 28 (January, 1972).

This article summarizes the theory and operation of atomic absorption spectrophotometry. Different procedures applicable to determine various metals is discussed. The metals include zinc, copper, iron, magnesium, manganese, silver, cobalt, nickel, cadmium, chromium, aluminum, beryllium, barium, vanadium, arsenic and mercury.

D-41 "Cadmium, Chromium, Lead, Mercury: A Plenary Account for Water Pollution, Part I - Occurrence, Toxicity and Detection," Cheremisinoff, Paul, N. and Yousuf H. Habib, Water and Sewage Works, Vol. 119, No. 7, p. 73 (July, 1972).

A description of the nature, sources and uses of the metals listed in the title are presented. The toxicity (level of concentration at which it becomes toxic) and toxic effects of each metal are also given. Analytic methods for detection of these elements are indicated.

D-42 "Monitoring New York's Water Automatically," Maylath, Ronald E., Journal of the American Water Works Association, Vol. 63, p. 517 (August, 1971).

This article describes the automatic monitoring system used throughout New York State. The surveillance network provides information to consulting engineers, industrial firms, and local, state and federal agencies. The system consists of different "Building Blocks," including major monitoring stations, remote terminals, and computer stations.

D-43 "TLC Finds Hexane Solubles," Atanus, Herbert, Water and Wastes Engineering, Vol. 11, No. 10, p. 26 (October, 1974).

A thin-layer chromatography (TLC) technique is used to help separate and identify hexane solubles at the Metropolitan Sanitary District of Chicago. A description of the technique and its advantages are given.

D-44 "Modern Monitoring of a Treated Industrial Effluent," Ostendorf, R. G. and J. F. Byrd, Journal of the Water Pollution Control Federation, Vol. 41, No. 1 p. 89 (January, 1969).

This article describes the monitoring system used by the Charmin Paper Products Company to monitor their waste treatment plant on the Susquehanna River. Parameters monitored automatically are total carbon, suspended solids, and pH. A detailed description of the system and its interlocks to the treatment plant are given.

D-45 "Rapid Instrumental Measurement of the Organic Load in Wastewaters," Lysyj, I. et. al., Journal of the Water Pollution Control Federation, Vol. 41, No. 5, p. 831, (May, 1969).

A pyrographic approach to determine the total organic carbon is presented in this article. The results of experiments are then compared and correlated to BOD values. These tests were run in Los Angeles.

D-46 "Comparison Studies of Winkler vs. Oxygen Sensor," Reynolds, Jeremiah F., Journal of the Water Pollution Control Federation, Vol. 41, No. 12, p. 2002 (December, 1969).

This article discusses two techniques to accelerate and simplify dissolved oxygen determinations compared to the Winkler test method. Both methods use oxygen sensors.

D-47 "Evaluation of Instrumentation and Control," Babcock, Russell H., Journal of the Water Pollution Control Federation, Vol. 44, No. 7, p. 1416 (July, 1972).

Methods to evaluate what automatic controls are practical in sewage treatment plants are discussed. The parameters discussed include control variables, the need for records, the caliber of personnel available, and the need for detection of alarm conditions. The advantages and disadvantages of electrical and pneumatic instrumentation are presented and compared.

D-48 "Analytical Determination of Metals Affecting Sewage Treatment," Riehl, M. L. and E. G. Will, Proceedings of the 4th Industrial Waste Conference, Purdue University (1948).

This paper describes the early work conducted to develop analytic methods for the determination of metals, such as copper, zinc, iron, chromium, nickel, cadmium, and cyanide. The methods include colorimetric, volumetric and gravimetric techniques.

D-49 "Monitoring Industrial Pollutants by Pyrolysis - Methane Detection Method," Lysyj, I. et. al., Journal of the Water Pollution Control Federation, Vol. 40, No. 5, Part 2, p. R181, (May, 1968).

This article discusses the monitoring of methyl-containing organic compounds, which occur in industrial wastes, but not in natural pollutants. Natural organic pollutants contain hydroxyl and amino groups. Therefore, the procedure discussed in this paper (the use of pyrolysis-methane detection methods) can determine whether an industry has discharged to a particular stream or treatment plant. The instruments include a gas chromatograph, a hydrogen flame ionization detector, a microcombustion furnace, and a recorder.

D-50 "Instrumentation for Water Pollution Control," Jones, Robert H., Pollution Engineering, Vol. 3, No. 6, p. 22 (November/December, 1971).

A brief summary of where controls and instrumentation can be used in a sewage treatment plant is indicated in this article. Their specific use in a plating waste treatment plant is also reported.

D-51 "A Rapid Method for the Estimation of Trace Amounts of Kerosene in Effluents,"Lee, E. G. H. and C. C. Walden, Water Research, Vol. 4, No. 9, p. 641 (1970).

This article discusses a method to determine the concentration of hydrocarbons in water, in the range of 10-100 mg/l. The method involves separating and concentrating the hydrocarbons by adsorption on activated carbon, followed by removing the hydrocarbons with acetone and measuring the turbidity of the acetone.

D-52 "Analysis of Water for Molecular Hydrogen Cyanide", Nelson, K. H. and I. Lysyj, Journal of the Water Pollution Control Federation, Vol. 43, No. 5, p. 799 (May, 1971).

The toxicity of cyanide and its relationship to the presence of HCN and total cyanide is reported in this article. The method presented for the measurement of hydrogen cyanide combines vapor phase equilibration (Gas chromatographic methods) with amperometric techniques. The technique consists of sparging a small portion of the undissociated HCN from the sample, trapping the HCN in dilute base, and then measuring the sparged HCN with a rotating gold anode.

D-53 "The Role of Automatic Sampling in Industrial Waste Control," Beach, Martha I, and C. Fred Gurnham, Mid Atlantic Industrial Waste Conference, No. 5 p. 225 (1971).

This paper reviews the advantages of industrial self-monitoring and presents a handbook type approach to the selection of the right type of sampling equipment.

D-54 "Atomic Absorption Spectrophotometer Facilitates Water Analysis," Water and Sewage Works, Vol. 121, No. 1, p. 27 (January, 1974).

This article describes how spectrophotomic techniques are used at the Ben Nesin Laboratory in New York State.

D-55 "Determination of Heavy Metals in Municipal Sewage Plant Sludges by Neutron Activation Analysis," Water, Air and Soil Pollution, Vol. 3, No. 3, p. 327 (September, 1974).

A discussion of the use of Neutron Activation Analysis (NAA) to scan sewage sludges for trace metal content is presented. The meanings of the variations in metal concentrations are discussed and the precision and potential of NAA is reported.

D-56 "The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes," Van Loon, J. C. et. al., Water, Air and Soil Pollution, Vol. 2, No. 4, p. 473 (December, 1973).

Atomic absorption spectroscopy procedures are outlined for the determination of some heavy metals in solids and liquids. Problems associated with sample preparation and sample solution interferences are described. Sewage treatment plant products (both liquid and solid) are analyzed and the results are given for samples representative of a wide range of sewage input patterns.

D-57 "Rapid Determination of Total Organic Carbon (TOC) in Sewage," Blackmore, R. H. and Doris Voshel, Water and Sewage Works, Vol. 114, No.10, p. 398 (October, 1967).

This article presents TOC data gathered at the Grand Rapids, Michigan sewage treatment plant by the use of the Leco Carbon analyzer connected to a Leco Combustion Furnace. This data is compared to data for BOD and COD on the same wastes.

D-58 "Statistical Evaluation of BOD verses ODI," Reynolds, Jeremiah F. and Karl A. Goellner, Water and Sewage Works, Vol. 121, No. 1, p. 31 (January, 1974).

This article describes the test procedure for the determination of the oxygen demand index (ODI).

D-59 "Gas-Liquid Chromatographic Techniques for Petrochemical Wastewater Analysis," Sugar, William J. and Richard A. Conway, Journal of the Water Pollution Control Federation, Vol. 40, No. 9, p. 1622 (September, 1968).

Laboratory techniques for efficiently selecting gas-liquid chromatographic (GLC) operating parameters based on different problems are described. Measurements can be made down to one mg/l. Emphasis was placed on the selection of column liquid phases for separation of a wide span of organic types, definition of the utility of temperature programming, and improvement of precision by use of an internal standard.

D-60 "Analysis of Municipal and Chemical Wastewaters by an Instrumental Method for COD Determination," Stenger, V. A. and C. E. Van Hall, Journal of the Water Pollution Control Federation, Vol. 40, No. 10 , p. 1755 (October, 1968).

This article reports the experience gained from a new method of COD determination. This method uses a vapor phase oxidation-reduction system and takes two minutes to complete. Tests were run on the wastewater at the sewage treatment plant at Midland, Michigan, and at the Dow Chemical Co. in the same city. The test results are reported.

D-61 "Differentiation of LAS and ABS in Water," Maeller, Claude Z. et. al., Journal of the Water Pollution Control Federation, Vol. 39, No. 10, Part 2, p. R92 (October, 1967).

A method of differentiating between ABS based detergents (Low Biodegradeability) and LAS based detergents (High Biodegradeability) can be achieved. This method combines and modifies those developed by Fairing and Short; and Frazee and Crisler. The method is described in this article.

D-62 "An Automated Method for the Determination of Formaldehyde in Sewage and Sewage Effluents," Musselwhite, C. C. and K. W. Petts, Water Pollution Control, Vol. 73, No. 4, p. 443 (1974).

This article presents a method to automatically measure the concentration of formaldehyde. The method utilizes a chemical reaction to produce a color which can be measured colorimetrically. An automatic analyzer is used as a necessary piece of equipment.

D-63 "A Safe Solvent for Oil and Grease Analyses," Chanin, G. et. al., Journal of the Water Pollution Control Federation, Vol. 39, No. 11, p. 1892 (November, 1967).

Procedures for determining oil and grease are presented, consisting of using either Trichlorotrifluoroethane or using the soxhlet extraction method for sludge, instead of hexane which is called for in "standard methods," but which can be dangerous in the laboratory.

D-64 "Comparative Studies of Dissolved Oxygen Analysis Methods," McKeown, J. J. et. al., Journal of the Water Pollution Control Federation, Vol. 39, No. 8, p. 1323 (August, 1967).

This paper compares the Winkler Method to the membrane electrode method of measuring dissolved oxygen. The interferences present in the sample are also discussed.

D-65 "Detection of Trace Metals in Water," Kerber, Jack, D., Industrial Water Engineering, Vol. 10, No. 5, (September/October, 1973).

A basic discussion on atomic absorption is presented. It's operation and application to the measurement of metals in water are discussed. Costs for equipment are also given.

D-66 "The Determination of Stable Organic Compounds in Waste Effluents at Microgram per Liter Levels by Automatic High-Resolution Ion Exchange Chromatography," Katz, Sidney et. al., Water Research, Vol. 6, No. 9, p. 1029 (September, 1972).

This article presents the results of a study using high-resolution ion exchange chromatography to measure pollutants in sewage. A description of the equipment, the field experiments, the results and conclusions are presented.

D-67 "Automated Fluorometric Method for Determination of Boron in Waters, Detergents and Sewage Effluents," Afghan, Badar K., et. al., Water Research, Vol. 6, No. 12, p. 1475 (1972).

This method of automatically measuring boron is based on the reaction of 4 chloro-2-hydroxy-4methoxybenzophenone (CHMB) with boron to produce fluorescent species in a 90% sulfuric acid medium. Measurements are in the 5-100 microgram per liter range. The equipment, procedures, and results of experiments are presented.

D-68 "Industry's Idea Clinic," various authors, Journal of the Water Pollution Control Federation, Vol. 37, No. 4, p. 508 (April, 1965).

A discussion was held on industrial waste automatic sampling among individuals at the Federation's 37th Annual Conference. Members of industry presented their experiences with different monitoring schemes including operational problems and solutions.

D-69 "An Industrial Waste Sampling Program," Woodruff, Paul H., Journal of the Water Pollution Control Federation, Vol. 37, No. 9, p. 1223 (September, 1965).

This article discusses the waste sampling program used by the Midland Division of the Dow Chemical Company. The mechanics of setting up a sampling program, and the sampling systems installed are both reported.

D-70 A Study of Methods used in Measurement and Analysis of Sediment Loads in Streams-Report T, Progress Report, Laboratory Investigation of Pumping-Sampler Intakes, Federal Inter-Agency Sedimentation Project, Minneapolis, Minnesota (April, 1966).

This document describes the development of a pumping sampler intake structure that is dependable and draws an accurate sample.

D-71 A Study of Methods used in Measurement and Analysis of Sediment Loads in Streams, Report U, An Investigation of a Device for Measuring the Bulk Density of Water-Sediment Mixtures, Beverage, J. P. and J. V. Skinner, Federal Inter-Agency Sedimentation Project, Minneapolis, Minnesota (August, 1974).

This booklet describes a device which was developed to test whether sediment concentration can be determined by measuring the bulk density of the liquid. The device is a special neutrally buoyant container. The displacement of an indicator rod is measured after equilibrium is reached. Results of the experiment are given and discussed.

D-72 A Study of Methods used in Measurement and Analysis of Sediment Loads in Streams, Catalog of Instruments and Reports for Fluvial Sediment Investigations, Federal Inter-Agency Sedimentation Project, Minneapolis, Minnesota, (June, 1974).

Suspended sediment samplers, bed material samplers, pumping type bottling samplers, a hand size analyzer, and a laboratory splitter, all developed by the Federal Inter-Agency Sedimentation Project, are described, with pictures and drawings.

D-73 "Orthophosphate Determinations Using Premeasured Reagents," Baskett, Russell C., Water and Sewage Works, January, 1973, p. 47.

A simple,fast orthophosphate measurement can be made by mixing 5 ml of sample with a premeasured polyethylene powder pillow,and measuring the color 1 minute later on a spectrophotometer (710 mμ). The chemical is PhosVer III (Hach Co.).

D-74 "Total Mercury Analysis: Review and Critique," Reimers, Robert S. et. al., Journal of the Water Pollution Control Federation, Vol. 45, No. 5, p. 815 (May, 1973).

This article presents a detailed discussion on the analysis for total mercury. Headings include techniques for wet oxidation and complete combustion of mercury samples; preconcentration of mercury, and analytical techniques including gravametric methods, volumetric methods, polarography, amperometric analysis, catalytic analysis, colorimetric analysis, and atomic absorption.

D-75 "Industrial Waste Treatment Plant Instrumentation," Babcock, R.H., Water and Waste Engineering, Vol.5, No.9, p. 3 (Sept. 1968).

This paper briefly discusses how controls and instrumentation can be used for pumping, cyanide destruction, chrome reduction, neutralization, and batch treatment.

D-76 Permit Program Guidance for Self-Monitoring and Reporting Requirements, United States Environmental Protection Agency, Office of Water Enforcement (October 1, 1973).

This document provides guidance to those interested in setting up a self-monitoring program. It is directed towards both industrial and municipal interests. The report includes guidance on data management, report schedules and many other areas.

D-77 "Automatic Samplers for Sewage and Effluents," Levin, V. H. and A. Latten, Process Biochemistry, June, 1973, p. 15.

This paper reviews various samplers, by manufacturer, and describes each one. The advantages and disadvantages of each machine are presented.

D-78 "Automatic Samplers," Wood, L. B., and H. H. Stanbridge, Water Pollution Control, Vol. 67, p. 495 (1968).

This article presents the results of a survey of automatic samplers available in England. The survey was conducted to help decide which samplers to use in the Department of Public Health Engineering of the Greater London Council. The article discusses general features to examine in samplers, and describes various samplers by manufacturer.

D-79 "Instrumentation in Water Pollution Control Analysis," Williamson, T. and A. S. Millar, Water Pollution Control, Vol. 70, (1971).

The use of instrumentation to replace classical "wet" methods to determine chemical analysis can be used to reduce analysis time and increase reliability and precision. This article discusses the auto analyzer, atomic-absorption spectrophotometer, and gas-liquid chromatography in reference to the above factors.

D-80 "In-Process Monitoring," Zabban, Walter, presented at the EPA Technology Transfer Seminar on Monitoring Industrial Wastewater, Arlington, Va., January 9, 1975.

This article presents the advantages of in process monitoring of wastes by industry. The article also discusses how process monitoring can be used to prevent treatment plant upsets, features to look for in monitoring equipment,and the use of monitoring to measure various parameters.

D-81 Literature Survey of Instrumental Measurements of Biochemical Oxygen Demand for Control Application,1960-1973, Environmental Monitoring Series, National Environmental Research Center, Office of Research and Development, U. S. EPA, Cincinnati, Ohio 45268, EPA-670/4-74-001 (February, 1974).

This report determines the state-of-the-art of instrumental biochemical oxygen demand methods. A survey of related literature published between 1960 and 1973 is used. An alternative solution is suggested for monitoring secondary treatment plants, using differential test values of a sample (e.g. Δ TOC, Δ TOD, or Δ COD).

D-82 Performance of the Union Carbide Dissolved Oxygen Analyzer, Environmental Monitoring Series, Office of Research and Development, U. S. EPA, Cincinnati, Ohio 45268, EPA 670/4-73-018 (July, 1973).

Union Carbide dissolved oxygen analyzer, model 1101, was evaluated to determine the effectiveness of the thallium electrode in the measurement of dissolved oxygen (DO). Tests included stability, transient response, linearity, and temperature compensation.

D-83 "The Work of the Dalmarnock Laboratory, Glasgow," Cunningham, M. F. et. al., Water Pollution Control, Vol. 72, No. 4, p. 392 (1973).

The monitoring and analysis activities of a sewage works laboratory are described. Activities include the use of gas liquid chromatography to identify oils, lithium salt injection to determine flow measurements, infra-red spectrophotometry to determine organic carbon content, atomic absorption spectrophotometry to determine mercury, and gas and thin layer chromatography to determine chlorinated organics.

D-84 "The Determination of Phenolic Materials in Industrial Wastes," Ettinger, M. B. and R. C. Kroner, Proceedings of the 5th Industrial Waste Conference, Purdue University p. 345 (1949).

This article reviews some methods and procedures that can be used to determine phenolic materials in industrial wastes. A detailed description is given of procedures to screen out interfering materials. The use of bromine demand and Gibbs techniques to determine phenol is also presented.

D-85 "Solvents in Sewage and Industrial Waste Waters: Identification and Determination," Ellison, W. K. and T. E. Wallbank, Water Pollution Control, Vol. 73, No. 6 p. 656,(1974).

The use of infra-red and ultra-violet spectroscopy in conjunction with gas chromatography is assessed as a detection and identification technique. Its application to identifying traces of immiscible solvent residues in samples of industrial waste waters, sewages and sludges is presented.

D-86 " Cobalt Interference in the Non-Steady State Clean Water Test," Kalinske, A. A. et. al., Water and Sewage Works, Vol. 120, No. 7, p. 54, (July, 1973).

Laboratory tests evaluated the oxygenation capacity of aeration equipment using the "non-steady state clean water techniques." Deoxygenation of the aerator test basin was accomplished by adding sodium sulfite and a cobalt salt catalyst. Cobalt interference in the determination of dissolved oxygen by the Winkler Method was also investigated.

D-87 "1975 Annual Review of the New Developments in Water Quality Instrumentation," Cheremisinoff, Paul N. and Richard Young, Pollution Engineering,March, 1975, p. 28.

This review reports the significant developments made by instrument manufacturers during 1975, and mentions some new products that may be useful to pollution engineers. Included is a list of instrument manufacturers.

D-88 "Thin Layer Chromatography as a Sorting Test for Metals in Trade Effluent," Bailey, A. R., Water Pollution Control, Vol. 68, No. 4, p. 449, (1969).

Detailed information is presented on procedures to identify and determine metal components in trade effluents. Thin layer chromatography is the recommended method. Results from the Purdy and Truter equation for determining metal concentrations are compared to those obtained from atomic absorption.

D-89 "Thin Layer and Gas Chromatographic Analysis of Parathion and Methyl Parathion in the Presence of Chlorinated Hydrocarbons," Kawahara, F. K. et. al., Journal of the Water Pollution Control Federation, Vol. 39, No. 3, p. 446, (March, 1967).

Methods to identify and measure chlorinated hydrocarbons and thiophosphate pesticides in water are described. The procedure used was employed to follow the course of accidental contamination in a river by pesticides. A discussion of sampling, extraction, analysis by thin layer and gas chromatography, and infra-red spectrophotometry are also included.

D-90 "Chloride Interference in Nitrate Nitrogen Determination," Malhotra, S. K., and A. E. Zanoni, Journal of the American Water Works Association, Vol. 62, No. 9, p. 568, (September, 1970).

This paper presents graphs to quantitatively determine the interference of chlorides in the Standard Methods test for Nitrate Nitrogen.

D-91 "Automatic Sampling and Measurement of Small Liquid Flows," Evans, M. R. and R. Edgar, Water Pollution Control, Vol. 70, (1971).

This article describes a sampling machine which was developed without using a peristaltic pump or a timing clock. The article also describes the construction of a low-cost flow recorder, which uses an overflow weir and a float-operated pen.

D-92 "Determination of Proteins in Waste Water," Woods, Calvin, Process Industrial Waste Control, Vol. 49, No. 4, p. 501 (July, 1965).

Different techniques for measuring proteins in wastewater are presented. The advantages and disadvantages of each technique are indicated. Some of the methods described include kjeldahl organic nitrogen, colorimetric determinations, the Folin reaction, and the Biuret reaction.

D-93 "Toxic Inorganic Materials and their Emergency Detection by the Polarographic Method," Offner, Harry G. and Edward F. Witucki, Journal of the American Water Works Association, Vol. 60, No. 8, p. 947, (August, 1968).

The use of polarography utilizing the dropping mercury electrode for rapid and easy antimony, arsenic, cadmium, lead, mercury,selenium, tellurium and thallium analysis is discussed. Discussions on these chemicals' physiological and toxic properties are also given.

D-94 "Monitoring with Carbon Analyzers," Arin, M. Louis, Environmental Science and Technology, Vol. 8, No. 10, p. 898 (October, 1974).

A comparison of different instruments available for TOC determinations is presented. A brief discussion of the correlation between TOC, BOD and COD is also contained.

D-95 A Quick Biochemical Oxygen Demand Test, U. S. EPA, Water Pollution Control Research Series, EPA No. 16050 EMF (06171), 48 pp.

A study was conducted to develop a satisfactory, short term biological oxygen demand test suitable for operational control of waste treatment processes. The test is a modification of the total biological oxygen demand (T_bOD) test. Laboratory experiments were conducted to examine the test, and experimental results are presented.

D-96 "Mercury in Public Sewer Systems," Evans, Ralph L., et al, Water and Sewage Works, February, 1973, p. 74.

This article presents the results of a study of five municipalities in central Illinois, which were found to contain from 0.1 to 7.9 ppb of mercury in their sewage. Analytical procedures and results are also presented.

D-97 "Ion-Selective Electrodes for Quality Measurement and Control," Babcock, R. H. Journal of the American Water Works Association, January, 1975, p. 26.

The theory and practice of ion-selective electrodes and their application to water quality measurement is discussed. The limitations of their use in the field is also considered.

D-98 "Detecting Pollutants with Chemical-Sensing Electrodes," Frant, Martin. S., Environmental Science and Technology, Vol. 8, No. 3, p. 224, (March, 1974).

The advantages and disadvantages of chemical-sensing electrodes for identifying toxic materials in wastewaters are considered. Several applicable analytical methods, detection limits, interferences and limitations are discussed. A list of commercially available electrodes and their area of application is provided.

D-99 "Variables to be Measured in Wastewater Treatment Plant Monitoring and Control," Roesler, Joseph F. and Robert H. Wise, Journal of the Water Pollution Control Federation, Vol. 46, No. 7, p. 1769, (July, 1974).

This article reviews methods of measuring those variables which would optimize wastewater treatment plant operation and control and minimize costs. The discussion centers on four different groups: Substrate variables, physical and chemical variables, suspended solids variables, and biological activity variables.

D-100 "When you go into a Manhole or a Sewer, you should Understand Sewer Gases," Nichols, Preston, R., Deeds, & Data, p. 2 (January, 1975).

The sources and characteristics of typical sewer gases are discussed. Eight different instances are considered where gas generation may occur in sewerage systems. Safety precautions for each instance is recommended.

D-101 "Monitoring and Treatment of Cyanide-Bearing Plating Wastes," Vought, John H., Journal of the Water Pollution Control Federation, Vol. 39, No. 12, p. 1971 (December, 1967).

The treatment and control of cyanide-bearing plating wastes are aided by an instrument performing continuous analysis and monitoring. The sampling and operation of this analyzer is described in detail and operating experiences are presented.

D-102 "Instrument for Monitoring Trace Organic Compounds In Water," H. C. Bramer et. al., Water & Sewage Works, Vol. 113, No. 8, p. 275 (August, 1966).

An ultra-violet spectrophotometer was developed to measure trace organic compounds in water. It has been demonstrated in qualitative and quantitative work on water bodies and waste effluents. These demonstrations are described in this article.

D-103 "How to Measure Industrial Wastewater Flow," Thorsen, Thor and Rolf Oen, Chemical Engineering, Vol. 82, No. 4, p. 95 (February 17, 1975).

Techniques for qualitative and quantitative wastewater analysis are discussed. Included is a table of methods for effluent analysis, their costs and reliabilities. Flow calculations and operating principals of weirs and flumes are also discussed.

D-104 "Determination of Cyanide in Industrial Effluents," Hewitt, P. J. and H. B. Austin, Water Pollution Control, Vol. 71, No. 4, p. 381 (1972).

This article reports on the development of a method to separate "free cyanide" from various complex cyanides. The effect of interfering substances on the rate of recovery of free cyanide is also assessed.

D-105 "Automated Analysis: The Determination of Ammoniacal, Nitrous and Nitric Nitrogen in River Waters, Sewage Effluents and Trade Effluents," Chapman, B. et. al., Water Pollution Control, Vol. 66, No. 2, p. 185 (1967).

The Technicon auto analyzer is evaluated for ammoniacial, nitrous and nitric nitrogen determinations in river and waste waters. The results are compared with standard analytical methods and presented in tabular form.

D-106 "Sampling and Monitoring Feature," Water and Waste Treatment, Vol. 16, No. 10, p. 11 (October, 1973).

This report includes a review of current water and wastewater sampling and monitoring equipment. The applications, limitations, manufacturer and description of each instrument is presented.

D-107 "Comparison of Air and Water Pollution Instrumentation," Rittmiller, Lawrence A. et. al., Pollution Engineering, Vol. 3, No. 6, p. 26 (November-December, 1971).

Sampling and analysis equipment for measuring air and water pollutants are discussed. Tables are included which provide information on instrument characteristics.

D-108 Simultaneous and Automated Determination of Total Phosphorus and Total Kjeldahl Nitrogen, Gales, Morris E., Jr., and Robert Booth, U.S. EPA, NTIS No. PB 232 710,p.19,(May,1974).

This study evaluates automated methods for the determination of total phosphorus and total kjeldahl nitrogen. Laboratory studies were conducted to evaluate the detection limits, precision and accuracy of three detection methods (Single Reagent Method for total phosphorus, Selenium Method for nitrogen, and Vanadium Method for nitrogen and phosphorus) in surface waters and wastewaters.

D-109 Instrumentation for Water Quality Determination, Mentink, ASCE, Water Resources Engineering Conference, March 8-12, 1965, 43 pp.

This pamphlet reviews the operation and theory of instrumentation that is used to measure basic water quality parameters. Several integrated water quality instrumentation systems are discussed. Included are illustrations of instrumentation and their circuits.

D-110 Automated Water Monitoring Instrument for Phosphorus Contents, Prager, Manfred, U. S. EPA, NTIS No. PB 222 772, June, 1973, 26 pp.

The development of a prototype automated water monitor for trace quantities of phosphorus compounds is reported. The method uses hydrogen flame emission spectroscopy. Operating parameters described include fuel and air flow rates, burner configuration, operating temperature and methods of sample aerosolization.

D-111 NPDES Permits and Water Analysis, Pojasek, Robert B. Environmental Science and Technology, Vol. 9, No. 4, p. 320, (April 1975)

This paper reviews the National Pollutant Discharge Elimination System (NPDES) procedure that is required for all individuals who discharge pollutants into a waterway from a point source. To receive a permit, the applicant must summarize his wastewater characteristics according to federally approved methods of sampling and analysis. Included is a table that compares analytical methods for determining water pollutants under the permit program.

D-112 "Complying with Discharge Regulations," Schafer, Carl J. and N. Lailas, Environmental Science and Technology, Vol. 8, No. 10, p. 903, (October, 1974).

Spokesmen of the federal Environmental Protection Agency report how industries and municipalities must monitor their wastewaters, and what help is available to meet the task of achieving compliance.

D-113 Wastewater Sampling Methodologies and Flow Measurement Techniques, Harris, Daniel J. and W. J. Keffer U. S. EPA No. 907/9-74-005, June, 1974, 117 pp.

This report consolidates and summarizes the activities, experience, sampling methods, and field measurement techniques of the Field Investigations Section of the EPA. Sources of error and data variability are also included.

D-114 Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems, U. S. EPA, NTIS No. PB 219/010, November, 1972 , 226 pp.

Quantitative methods for the preliminary design of water quality surveillance systems are developed and demonstrated in this report. The quantitative methods are organized into a User Handbook. The methods were illustrated on the Wabash River Basin and the results were satisfactory.

D-115 Estimation of Polychlorinated Biphenyls in the Presence of DDT-Type Compounds, U. S. EPA, NTIS No. PB 233 599, June, 1974, 90 pp.

Research to develop a simple, rapid method for determining PCB, and DDT in water is reported. The emphasis in the experiments is on the sensitivity and specificity of luminescence. Studies include the determination of recoveries and detection sensitivities for compounds of interest. An analysis of several environmental waters is also reported.

D-116 Analysis for Mercury in Water, A Preliminary Study of Methods, U. S. EPA No. R4-72-003, September, 1972, 58 pp.

A study to develop analytical methods to determine mercury (organic and inorganic) in water is reported. A comparison of various methods in both distilled and surface waters was made.

D-117 Test Procedure and Standards - ABS and LAS Biodegradability, The Soap and Detergent Association Scientific and Technical Report No. 3, January, 1966, 16 pp.

A procedure to determine the biodegradability of ABS and LAS surfactants is described. Results of two biodegradability test methods, the shake flask and the semicontinuous activated sludge, are presented.

D-118 Field Tests of LAS Biodegradability, The Soap and Detergent Association,Scientific and Technical Report No. 2, September, 1965, 36 pp.

Field studies were undertaken to evaluate the biodegradability of LAS in extended aeration activated sludge plants under normal operating conditions. The results of four different field tests are presented.

D-119 "A New Automatic Sampler for Industrial Outfall, Streams and Sewers," Brailsford, H. D., Water and Sewage Works, September, 1968.

The operation of a timer-controlled intermittent pump type sampler is described in this article. A schematic diagram of its circuit is also presented.

D-120 Fluorescent Probes in the Detection of Insecticides in Water, U. S. EPA, NTIS No. PB 221 336, April, 1973, 41 pp.

Laboratory research has been conducted to synthesize one or more fluorescent probe molecules which would be useful in the analytical methodology for insectide determinations in water. Development of experimental parameters for design and synthesis of optimum probe molecules is reported in this booklet.

D-121 Environmental Applications of Advanced Instrumental Analyses: Assistance Projects, FY 69-71, U. S. EPA, May, 1973, 82 pp.

A multitude of analyses involving the identification and measurements of organic pollutants in water are discussed under eleven project categories involving a pollution incident. In most cases these analyses have helped to solve, or at least understand more clearly the related pollution incident. In some cases the analyses provided evidence for enforcement of regulatory legislation.

D-122 Current Practice in GC-MS Analysis of Organics in Water, U. S. EPA, NTIS No. PB 224 947, August, 1973, 91 pp.

Experiences during five years of evaluating the application of gas chromatography mass spectrometry to wastewater analysis is reported. Procedures are described to analyze for organic water pollutants, including sample collection, handling, preparation, analysis, interpretation of the results, and confirmatory techniques. Case histories illustrating the techniques are also included.

D-123 "Instrumentation in Pollution Control," Snowden, F.C., Industrial Water Engineering, Vol. 7,No. 6, p.22,(June,1970).

Sensors and analyzers for various water quality determinations are discussed, including pH, conductivity, dissolved oxygen, and temperature meters. Techniques for measuring process wastes are also discussed. Considered are: plating wastes, acid-base neutralization, activated sludge and flocculation control. Instrumentation for measuring air pollutants is also considered.

D-124 Sampling of Wastewater, Shelly, Philip E., U. S. EPA, Technology Transfer, Washington, D. C. 20460, June, 1974, 115 pp.

This handbook summarizes wastewater sampling techniques and equipment. It includes a list of sampler manufacturers, and detailed descriptions of some commercially available equipment.

D-125 Industrial Wastewater Discharges, Compiled and edited by Bureau of Water and Wastewater Utilities Management, Division of Pure Waters, June, 1969, Albany, N. Y. available from the Health Education Service, P. O. Box 7283, Albany, N. Y. 12224, 56 pp.

This guide is a compilation of policy, procedural and technical suggestions for measuring and reporting industrial wastewater characteristics. Part 1 describes the design of a testing and measurement program and Part 2 describes administrative aspects.

D-126 Organic Pollutant Identification Utilizing Mass Spectrometry, U. S. EPA, NTIS No. PB 224 544, July, 1973.

A system for the rapid identification of volatile organic water pollutants has been developed. It involves gas chromatography/mass spectrometry with computerized matching of mass spectra. Examples are presented to illustrate the use of GC/MS for specific identifications.

D-127 Pyrographic Gross Characterization of Water Contaminants, U. S. EPA, No. EPA R2-73-227, May, 1973, 94 pp.

A method has been developed for direct analysis of organic materials in aqueous solutions. The method is based on thermal fragmentation followed by gas chromatographic separation and detection of the resulting derivative composition. The results of a field study are reported, and include: a definition of area of potential application of this technique, development of reliable analytical procedures, and development of an efficient data handling system.

D-128 Detection and Characterization of Animal/Vegetable and Petroleum Oil in Municipal Wastewater by Thin Layer Chromotography; C. D. Cramer, Nader Chemical Co.; Oak Brook, Illinois.

An evaluation is made of the thin layer chromatographic procedure for the separation and quantification of animal/vegetable and petroleum oil in municipal wastewaters.

D-129 Thin Layer Chromatographic Method for the Determination of Petroleum on Mineral Hydrocarbons and Other Natural or Synthetic Oils and Greases; Lee Henry, Mogul Corporation; Chagrin Falls, Ohio.

The report is an appraisal of an analytical method for the determination of saturated hydrocarbons, triglycerides, and fatty acids in municipal wastewaters.

For additional information pertaining to this section, please refer to the following articles:

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SECTION E - POLLUTANTS WHICH INTERFERE WITH PUBLICLY OWNED TREATMENT WORKS

Reference: Volume I, Section E
Volume II, Appendix 5

E-1 "Copper and Anaerobic Sludge Digestion", McDermott, G.N., et.al., Journal of the Water Pollution Control Federation, Vol. 35, No. 5, p. 655 (May, 1963).

The digestion of sludges obtained from sewage to which copper in known concentrations was fed continuously was observed in pilot plant studies. Digester performance was measured by gas production. Studies of the effect of slug doses were also made.

E-2 "Effects of Copper and Lead Bearing Wastes on the Purification of Sewage", Water and Sewage Works, Vol. 93, No. 1, p. 30 (January, 1946).

A procedure to examine the effects of small concentrations of metal ions on the metabolism of sewage is reported. The metal ion effects on nitrification are also discussed.

E-3 "Toxicity, Synergism, and Antagonism in Anaerobic Waste Treatment Processes", Kugelman, I.J. and K. K. Chin, Advanced Chemistry, Series 105, Vol. 55, p. 55 (1971)

This report reviews the literature on toxicity, synergism and antagonism in anaerobic digesters. Experimental inadequacies on much published data are pointed out, and methods of minimizing toxic effects of metals and certain organics are indicated. The paper also attempts to categorize quantitatively toxicity and stimulation, on an absolute basis.

E-4 "Summary Report on the Effects of Heavy Metals on the Biological Treatment Processes", Barth, E. F., et.al., Journal of the Water Pollution Control Federation, Vol. 37, No. 1, p. 86 (January, 1965).

The effects of copper, chromium, nickel and zinc, individually and in combination on biological treatment processes were studied in pilot plant tests. No-effect doses were determined for the aeration and anaerobic digestion phases. Distribution of metals through the activated sludge process and the concentration in the final effluent were also indicated.

E-5 "Review of Literature on Toxic Materials Affecting Sewage Treatment Processes, Streams, and BOD Determinations", Rudolfs W., et. al., Sewage and Industrial Wastes, Vol. 22, No. 9, p. 1157 (September, 1950).

The review of the literature is divided into three parts. The first part comprises the effect of toxic materials (both organic and inorganic) on sewage treatment processes (both aerobic and anaerobic). It includes a review of the effects of various industrial wastes. The second part reviews the literature that pertains to the physical, chemical, and biological effects of pollutants on streams. The third part reviews the literature on the use of the BOD test as a tool for the detection of inhibitory substances on the oxidation of sewage. Also included is a table listing concentrations of wastes and compounds which inhibit or retard various treatment processes, and flora and fauna.

E-6 "Zinc in Relation to Activated Sludge and Anaerobic Digestion Processes", McDermott, Gerald N., et.al., Proceedings of the 17th Industrial Waste Conference, Purdue University, p. 461 (1962).

The efficiency of treatment of sewage containing zinc was studied by operation of pilot activated sludge plants. The objectives of the research were to determine the level of zinc that can be tolerated without reducing treatment plant efficiency, and to determine the efficiency of the process in removing zinc.

E-7 "The Effects of Industrial Wastes on Sewage Treatment", Masselli, Joseph W., et.al., Report prepared by New England Interstate Water Pollution Control Commission, June, 1965.

The effect of industrial wastes on sewage treatment has been reviewed, and methods which may alleviate their effect have been described. Analytical data on metallic content of Connecticut sewages have been recorded and rehabilitation of metal-sick digesters by use of sulfide and sulfate is described.

E-8 Environmental Effect of Photoprocessing Chemicals, Vol. 1, Report by the National Association of Photographic Manufacturers, Inc., 600 Mamaroneck Ave., Harrison, N.Y. 10528 (1974)

The effects of photographic chemicals on conventional treatment systems and on aquatic organisms are examined. Included are results and discussion of wastewater analysis and the development of a model to predict downstream response to photoprocessing effluent.

E-9 Environmental Effect of Photoprocessing Chemicals, Vol. II, Report by the National Association of Photographic Manufacturers, Inc., 600 Mamaroneck Avenue, Harrison, N.Y. 10528, 1974, 324 pp.

This volume contains a detailed compilation of all the experimental procedures, results, and data analysis, and provides data to support the statements and conclusions of Vol. I (See Reference E-8).

E-10 Fate of Benzidine in the Aquatic Environment: A Scoping Study, U. S. EPA Contract # 68-01-2226, January, 1974.

To determine the fate of benzidine in the aquatic environment, the stability of the aqueous phase of benzidine in biologically active systems was studied in the laboratory. Long term BOD and respirometer studies were used to measure the removal or continued presence of aqueous benzidine.

E-11 "Anaerobic Processes - Literature Review", Ghosh, S., Journal of the Water Pollution Control Federation, Vol. 44, No. 6, p. 948 (June 1972).

Review of the 1971 literature revealed that a greater emphasis was placed by researchers on evaluating the effects of various inhibitory chemicals on the performance of anaerobic digesters. Also, considerable effort was directed toward evaluating the fate of precipitated, insoluble phosphates added to digesters, along with primary and/or secondary sludge.

E-12 "Effects of Chromium On the Activated Sludge Process", Moore, W. Allan, et. al., Journal of the Water Pollution Control Federation, Vol. 33, No. 1, p. 54 (January 1961). Also published in the Proceedings of the 15th Industrial Waste Conference (1960), Purdue University, p. 158.

Pilot plant studies were conducted to determine the extent to which sewage processes can tolerate chromium wastes. Removal efficiencies (BOD and chromium) and the distribution and concentrations of chromium in various treatment units were examined. Digester effects and sludge settleability were also studied.

E-13 "Pilot Plant Experiments on the Effects of Some Constituents of Industrial Waste Waters on Sewage Treatment", Wheatland, A.B., et.al., Water Pollution Control, Vol. 70, p. 626 (1971).

Pilot studies to assess the effects of copper, nickel, zinc and chromium on activated sludge performance are outlined with a view towards developing a realistic assessment of user costs based on treatability.

E-14 "Nickel in Relation to Activated Sludge and Anaerobic Digestion Processes", McDermott, G.N., et.al., Journal of the Water Pollution Control Federation, Vol. 37, No. 2, p. 163 (February 1965).

Pilot plant studies were conducted to determine the level of nickel in waste waters that can be tolerated by aerobic and anaerobic biological treatment processes. The studies included the determination of the efficiency of the processes in removing nickel.

E-15 "Limits for Toxic Wastes in Sewage Treatment", Coburn, Stuart, Sewage Works Journal, Vol. 21, No. 3, p. 522 (1949).

This paper reviews some of the deleterious effects of industrial wastes on municipal treatment systems. The question of pretreatment standards is also discussed.

E-16 Controlling the Effects of Industrial Wastes on Sewage Treatment, Masselli, et.al., Technical Report prepared for the New England Interstate Water Pollution Control Commission by Wesleyan University, June 1970, 62 pp.

Factors involved in the joint treatment of industrial and domestic wastewaters are discussed. A discussion on the composition of domestic and industrial wastes, the functions of a treatment plant, the effects and control of industrial wastes, and a monitoring and analysis program are included. Major industrial processes are reviewed and their wastewaters described. Recommendations are made for a control program which maximizes treatment and minimizes deleterious effects on treatment systems.

E-17 "Anaerobic Processes", Pohland, F.G. and S. J. Kang, Journal of the Water Pollution Control Federation, Vol. 43, No. 6, p. 1129 (June 1971).

This article reviews the 1970 literature on the microbiology and mechanisms involved in anaerobic processes, and on the factors inhibiting these processes.

E-18 "Mercury in Anaerobic Sludge Digestion", Lingle, James W. and Edward R. Hermann, Journal of the Water Pollution Control Federation, Vol. 47, No. 3, p. 466 (March 1975).

Laboratory studies were conducted to determine whether mercuric chloride in various concentrations are converted into methyl mercury in the anaerobic sludge digestion process. The distribution of mercury within the digester was also determined.

E-19 "White Water Treatment", Rudolfs, William and H. R. Amberg, Sewage and Industrial Wastes, Vol. 24, No. 10, p. 1278 (October 1952).

Laboratory studies determined the effect of various concentrations of soluble sulfide upon the anaerobic digestion process. White water and sodium acetate were used as substrate in these studies.

E-20 "Digestion Fundamentals Applied to Digester Recovery - Two Case Studies", Dague, Richard R., et. al., Journal of the Water Pollution Control Federation, Vol. 42, No. 9, p. 1666 (September 1970).

The authors attempted to interpret the theory of anaerobic digestion as applied to digester operation. They report the experiences encountered in solving the problems of two anaerobic digester upsets.

E-21 "The Effects of Heavy Metals and Toxic Organics on Activated Sludge", Goss, Thomas A., Masters Thesis, University of Pittsburgh (1969).

Manometric techniques were used to determine the relative respiration rates of nonacclimated activated sludge to various heavy metals and organics. Threshold limits of sludge to these components were determined.

E-22 "Effect of High Sodium Chloride Concentration on Trickling Filter Slimes", Lawton, Gerald W. and Clarence Eggert, Sewage and Industrial Wastes, Vol. 29, No. 11, p. 1228 (November 1957).

Pilot plant studies were conducted to determine whether trickling filter slimes can satisfactorily stabilize organic matter in saline wastes. The effect of these wastes on growths already developed was investigated. Both acclimated and non-acclimated slimes were examined.

E-23 Aqueous Wastes from Petroleum and Petrochemical Plants, Beychok, M.R., John Wiley & Sons, N. Y., 1967.

Pollutants found in petroleum and petrochemical wastewaters and their environmental effects are discussed. Effluent quality standards from several governmental authorities are included.

E-24 "Effects of Copper on Aerobic Biological Sewage Treatment", McDermott, Gerald N., et.al., Journal of the Water Pollution Control Federation, Vol. 35, No. 2, p. 227 (February 1963).

Pilot plant studies were conducted to determine the effects of copper on biological treatment systems. BOD removal efficiencies were determined under steady feed and slug doses of copper feed. No-effect concentrations are given.

E-25 "Field Survey of Four Municipal Wastewater Treatment Plants Receiving Metallic Wastes", Barth, E.F., et.al., Journal of the Water Pollution Control Federation, Vol. 37, No. 8, p. 1101 (August 1965).

Four municipal wastewater treatment plants that receive metallic wastes were sampled for treatment efficiency. Metal distribution among the individual treatment units was determined. Concentration levels that cause no reduction in treatment plant efficiency are also given.

E-26 Treatability of Oil and Grease Discharged to Publicly Owned Treatment Works, U. S. Environmental Protection Agency, EPA No. 440/575/066, Pretreatment Requirements for Oil and Grease, April, 1975.

This document discusses the available methods for the removal of oil and grease from waste streams. Other items discussed include the method of analysis and currently acceptable concentrations for oil and grease.

E-27 Toxic Materials Analysis of Street Surface Contaminants, Office of Research and Development, U. S. EPA Report #R2-73-233, August 1973.

Metal loading from road surface runoff is tabulated and compared to normal sanitary sewage flow. The relationship between metals in runoff and metals in sewage treatment plant effluent is made, to evaluate the effect on receiving waters. The effect that collecting runoff in a combined system will have on biological systems is explored. A table summarizes metal concentrations necessary to cause reduction in biological treatment systems.

E-28 "Annual Report - Control of Toxic and Hazardous Material Spills in Municipalities", Brinsko, G.A., Allegheny County Sanitary Authority., November 4, 1974.

This demonstration project, partially funded by the EPA, involves developing a comprehensive program for the management and control of hazardous materials in the Allegheny County Sanitary Authority municipal wastewater treatment and collection system. The program will include the development of an early warning system with appropriate monitoring and surveillance equipment to permit the plant to respond operationally to shock loadings of contaminants. The demonstration grant is composed of seven specific tasks which include:

1. Literature and Source Review
2. Inventory
3. Pilot Plant Evaluation
4. Monitoring and Surveillance Systems
5. Contingency Plan
6. Operational Modifications to the ALCOSAN Plant
7. Surcharge, Financing and Legislation

This summary deals with work accomplished during the first year of this two-year project.

E-29 A Handbook on the Effects of Toxic and Hazardous Materials On Secondary Biological Treatment Processes, A Literature Review, Environmental Quality Systems, Inc., Rockville, Maryland, prepared for the Allegheny County Sanitary Authority and the EPA, Sept. 1973, unpublished.

A major goal of this work was to provide background information relating to the effects of toxic and hazardous materials on the performance of biological treatment processes. In addition, background information was collected on the effects of biological processes on toxic materials. The information is presented in four sections: an introduction, the matrix of toxic and hazardous material information, the list of references used to generate the tabular matrix, and a supplementary list of chemicals.

E-30 "Effects of Alum Addition on Activated Sludge Biota", Anderson, Douglas T. and Mark J. Hammer, Water and Sewage Works, Vol. 120, No. 1, p. 63 (Jan. 1973)

Laboratory studies were conducted to determine the effect of aluminum sulfate (alum) addition to the activated sludge process. The influence of alum on higher life forms and on BOD removals were examined. A comparison was made between effects on domestic and synthetic (glucose-glutamic acid substrate) wastewater.

E-31 "Literature Review", Journal of the Water Pollution Control Federation, Vol. 46, No. 6, p. 1034 (June, 1974).

A review of the preceding year's literature is presented, including:

1. Treatment technology for major industrial effluents including paper, dairy, chemicals, petroleum, plating, meat, fish, poultry, and fermentation(pharmaceuticals, corn, sugar) industries.
2. Sampling and analysis techniques for continuous monitoring, organic and inorganic chemicals.
3. Physical-chemical waste treatment methods.
4. Microbiology and mechanisms of anerobic processes.
5. Sources, fate, effects of metals and other trace elements.
6. The identification, interactions, inhibitions of waste treatment microbiota.

E-32 "Activated Sludge Studies with Phenol Bacteria", Radhakrishnan, I., and A. K. Sinha Ray, Journal of the Water Pollution Control Federation, Vol. 46, No. 10, p. 2393 (Oct. 1974).

A series of laboratory studies were conducted to determine the concentrations of phenol that can be metabolized by *Bacillus cereus* bacteria. Also studied were nitrogen-deficient conditions, temperature variations, and the results of contaminating the culture with wastewater.

E-33 "Biological Treatability of Trinitrotoluene Manufacturing Wastewater", Nay, Marshall W. Jr., et.al., Journal of the Water Pollution Control Federation, Vol. 46, No. 3, p. 485 (March, 1971)

Laboratory studies were conducted to define the amenability of neutralized wastewater from the counter-current, continuous flow trinitrotoluene (TNT) manufacturing process to biodegradation. The feasibility of using biological processes for treatment of the wastewater was also evaluated.

E-34 "Toxicity of Copper to Activated Sludge," Ayers, K. C. et. al., Proceedings of the 20th Industrial Waste Conference (1965) Purdue University.

This article summarizes studies carried out at Ohio State University in which attempts were made to investigate the actual mechanism causing partial failure of the activated sludge process due to shock loadings of copper. A description of the pilot plant and the results of the experiments are presented. The work of previous investigations is also discussed.

E-35 "The Effects of Sulfides on Anaerobic Treatment", Lawrence, Alonzo W., et.al., Proceedings of 19th Industrial Waste Conference, Purdue University (1964), p. 343.

The effects of soluble and insoluble sulfides on anaerobic treatment were investigated by the operation of a series of laboratory digesters receiving daily sulfide additions. Experimental results were discussed with respect to toxic concentrations of soluble sulfides. Possible methods for controlling and eliminating sulfide toxicity were also indicated.

E-36 "Slug of Chromic Acid Passes Through a Municipal Treatment Plant", English, J. N., et.al., Proceedings of 19th Industrial Waste Conference (1964), Purdue University, p. 493.

A field study was undertaken to determine the effects of passage of a chromic acid slug on the efficiency of a municipal sewage treatment plant. In addition to the levels of chromium in the plant processes attributable to the chromic acid slug, background data on the concentrations of chromium, copper, zinc and nickel are also presented.

E-37 "Cation Toxicity and Stimulation in Anaerobic Waste Treatment II. Daily Feed Studies", Kugelman, Irwin J. and P. L. McCarty, Proceedings of 19th Industrial Waste Conference (1964),Purdue University, p. 667. Also presented in the Journal of the Water Pollution Control Federation, Vol. 37, p. 97 (1965).

Laboratory studies to investigate cation effects under daily feed conditions on anaerobic waste treatment systems are reported. These studies provide the sanitary engineer with data which can be used to design waste treatment systems. Cation concentrations are examined singly and in combination to determine synergistic and antagonistic effects.

E-38 "Determination of Biodegradability Using Warburg Respirometric Techniques", Hunter, J. V. and H. Heukelekian, Proceedings of the 19th Industrial Waste Conference (1964), Purdue University, p. 616.

Laboratory studies are reported which examine the Warburg Respirometer as a biodegradability technique. Its applications, procedures for use, interpretations, and the advantages and disadvantages inherent in its use are also presented.

E-39 "The Role of Iron in Anaerobic Digestion", Pfeffer, John T, and James E. White, Proceedings of the 19th Industrial Waste Conference, (1964) Purdue University, p. 887.

Laboratory studies are reported examining the relationship between iron loading and digester efficiency. The role of iron in reducing soluble phosphate concentrations by precipitation is studied, and the relationship between soluble phosphate concentration and digester efficiency is examined.

E-40 "Substrate Interaction during Shock Loadings to Biological Treatment Processes", Komolrit, K. and A. F. Gaudy, Jr., Proceedings of the 19th Industrial Waste Conference, (1964) Purdue University, p. 796. Also presented in the Journal of the Water Pollution Control Federation, Vol. 38, No. 8, p. 1259 (August, 1966).

Laboratory studies were conducted under severe shock loading conditions to examine substrate dependence of sequential substrate removal phenomena. A metabolic flow chart for various carbohydrates and related sugar alcohols shows the metabolic pathways.

E-41 "Effect of High Concentrations of Individual Volatile Acids on Anaerobic Treatment, McCarty, Perry L. and Marc Brosseau, Proceedings of the 18th Industrial Waste Conference (1963), Purdue University, p. 283.

Laboratory studies were conducted to investigate the effects of high concentrations of volatile acids individually and in combination on the digestion of sewage sludge. The purpose was to determine whether volatile acid buildup is the cause or effect of digester upset.

E-42 "A Procedure for Continuous Nitrification Corrections During Warburg Respirometer Studies", Symons, James, and Roger LaBonte, Proceedings of the 18th Industrial Waste Conference (1963), Purdue University, p. 498.

Background and a discussion of oxygen uptake due to nitrification during Warburg Respirometer biodegradation studies is reported in this article. The paper includes a discussion on possible solutions, theoretical considerations and correction possibilities in order to deal with the nitrification problem.

E-43 "The Physical and Biological Effects of Copper on Aerobic Biological Waste Treatment Processes", Moulton, Edward Q., and Kenesaw S. Shumate, Proceedings of the 18th Industrial Waste Conference (1963), Purdue University, p. 602.

Laboratory studies were conducted to explain the effects of copper toxicity on aerobic biological treatment systems. The effects of copper dosage on BOD and COD are examined. An explanation of the path and fate of copper ions is proposed.

E-44 "Effect of Boron on Aerobic Biological Waste Treatment", Banerji, Shankha K., et.al., Proceedings of the 23rd Industrial Waste Conference (1968), Purdue University, p. 956.

Laboratory studies are reported on the effects of boron on an activated sludge system. The effects of different concentrations of boric acid on the growth and on the substrate removal rate of acclimated activated sludge is indicated. Settling characteristics of the sludge are examined and a literature review of the effects of boron on treatment processes and on aquatic life is included.

E-45 "Development of Biological Treatment Data for Chemical Wastes", Ford, Davis L., et.al., Proceedings of the 22nd Industrial Waste Conference (1967), Purdue University, p. 292.

Laboratory experiments were conducted to develop design criteria for chemical wastes. The feasibility of treating industrial wastewaters on a laboratory scale is examined.

E-46 "Carbon as a Parameter in Bacterial Systems Growth Limitation and Substrate Utilization Studies", Rickard, M.D. and W. H. Riley, Proceedings of the 20th Industrial Waste Conference (1965), Purdue University, p. 98.

The utility of carbon analysis to trace the metabolism of organic compounds is surveyed. The relationships obtained among cellular carbon, exogenous soluble carbon and viable count during bacterial growth are examined with the rates of synthesis of cellular material.

E-47 "Effect of Acrylonitrile on Anaerobic Digestion of Domestic Sludge", Lank, John C. Jr., and Alfred T. Wallace, Proceedings of the 25th Industrial Waste Conference (1970), Purdue University, p. 518.

Laboratory studies were conducted to examine the effects of acrylonitrile on anaerobic digestion. Included is a literature survey on the effects of acrylonitrile on aquatic life and aerobic biological treatment.

E-48 "Trace Metals and Filamentous Microorganism Growth", Pfeffer, John T., et.al., Proceedings of the 20th Industrial Waste Conference (1965), Purdue University, p. 608.

Laboratory experiments were conducted to determine the trace metal requirements that are necessary for bacterial and fungal growth.

E-49 "Some Effects of High Salt Concentrations on Activated Sludge", Kincannon, D.F. and A. F. Gaudy, Jr., Proceedings of the 20th Industrial Waste Conference (1965), Purdue University, p. 316. Also presented in the Journal of the Water Pollution Control Federation, Vol. 38, No. 7, p. 1148 (July 1966).

Laboratory experiments were conducted to determine the effects of shock loadings of high salt concentrations on sludges developed in waters with low salt content. Conversely, the effects of fresh water on sludges developed in a salt water medium were also examined. Settling characteristics, removal efficiencies and cellular components were indicated.

E-50 "The Effect of Surface Active Agents on Substrate Utilization in an Experimental Activated Sludge System", McClelland, Nina I. and K. H. Mancy, Proceedings of the 24th Industrial Waste Conference (1969) p. 1361.

Laboratory studies to determine the effect of ABS (alkylbenzene sulfonate) and LAS (linear alkylate sulfonate) on the performance of an activated sludge system are reported. The mechanism of interference with activated sludge systems of compounds with surface active characteristics is also presented.

E-51 "Combined Treatment of Chemical Wastes and Domestic Sewage in Germany", Bischofsberger, Wolfgang, Proceedings of the 24th Industrial Waste Conference (1969), Purdue University, p. 920.

Pilot plant studies were conducted to determine whether chemical wastes needed to be treated separately or could be combined with domestic sewage. Basic criteria for plant design were developed for a combined activated sludge system.

E-52 "Factors Responsible for Non-Biodegradability of Industrial Wastes," Irvine, Robert L. Jr. and A. Busch, Proceedings of the 24th Industrial Waste Conference (1969), Purdue University, p. 903.

This paper discusses some basic concepts in biochemistry that can be used to understand the true meaning of biodegradability. The article indicates how these concepts may be used to develop new treatment practices. It points out that some materials that are termed "nonbiodegradable" may be degradable under a different set of conditions.

E-53 "Composition Studies of Activated Sludges," Burkhead, Carl E. and Samuel Waddell, Proceedings of the 24th Industrial Waste Conference (1969), Purdue University, p. 576.

Laboratory studies were conducted to determine the change in chemical composition of activated sludges grown in batch fed units with various pure organic substrates. Energy-synthesis data were also collected to more completely define the chemical changes taking place throughout all phases of the growth cycle.

E-54 "Sludge Activity Parameters and Their Application to Toxicity Measurements and Activated Sludge," Patterson, James W. et al., Proceedings of the 24th Industrial Waste Conference (1969), Purdue University, p. 127.

This paper reviews the advantages and disadvantages of standard treatment unit monitoring methods. Other specific biochemical parameters and their applicability to activated sludge systems under toxic stress are discussed. A procedure for ATP(adenosine triphosphate) analysis for use as a quantitative measurement of microbial biomass and activity is also included.

E-55 "Chlorinated Hydrocarbons: Emerging Implications in Regional Planning," Shea, Timothy and Williams Gates, Proceedings of the 24th Industrial Waste Conference (1969), Purdue University, P. 1448.

A study was conducted to develop estimates of chlorinated hydrocarbon emissions in municipal and industrial wastewaters and in water and sediments in the San Francisco Bay-Delta region. A mass balance of pesticide transport into and from the Bay System was also discussed.

E-56 "Dissolved - Copper Effect on Iron Pipe," Cruse, Henry, Journal of the American Water Works Association, Feb., 1971, p. 79.

Several case studies are presented to show the corrosion effects of galvanized iron pipe as a result of copper concentrations as low as .01 mg/l. Copper sources include water supply, copper addition for algae control and copper pipe upstream of the iron pipe.

E-57 "Identification and Testing of Compatible Industrial Wastes," Hastings, P. C. and M. W. Davis, Jr., Proceedings of the 27th Industrial Waste Conference (1972), Purdue University, p. 515

Laboratory studies are reported which examine two wastes (Kraft mill bleachery waste of the caustic stage and aluminum containing waste) which mixed together cause a physiochemical reaction resulting in precipitation of organic and inorganic materials. Location of plants with a view towards joint treatment of compatible wastes is suggested.

E-58 "Effect of Chrome Plating Wastes on the Warsaw, Indiana Treatment Plant," Erganian, George K., Proceedings of the 14th Industrial Waste Conference (1959) Purdue University, p. 127.

An evaluation of the effect of chrome plating wastes on the operation of an activated sludge plant is reported. Relationships between chrome concentration and treatment efficiency, sludge index, and return sludge concentration are presented. Consideration is given to the need for ferrous sulfate as a pretreatment device for chrome bearing wastes. Chrome removals as a result of treatment are also examined.

E-59 "Significance of a Highly Alkaline Industrial Waste In a Municipal Waste Water Treatment Plant," Leary, R. D., et. al., Proceedings of the 26th Industrial Waste Conference, (1971), Purdue University, p. 566.

The effect of a high alkaline - high chromium content glue and gelatin plant waste on a primary treatment plant is reported. Laboratory study results are also presented on the effects of these wastes on anaerobic digestion. Data is provided on treatment plant performance before and after discharge of the trade waste.

E-60 "Some Effects of Copper on the Activated Sludge Process," Directo, Leon S. and Edward Moulton, Proceedings of the 17th Industrial Waste Conference (1962), Purdue University, P. 95

The results of pilot plant studies to evaluate the response of activated sludge to various situations are presented in this article. Responses to shock loadings of copper under varying organic loadings and to various suspended solids concentrations are both reported.

E-61 "The Effect of ABS Shock Loadings on the Activated Sludge Process," Bennett, E. R. and D. W. Ryckman, Proceedings of the 16th Industrial Waste Conference (1961), Purdue University, p. 52.

Laboratory studies were conducted to investigate the effect of shock loadings of ABS on the activated sludge system and to gain an insight into the mechanism involved in the interaction of ABS and the activated sludge microorganisms. The results of these tests are presented in this paper.

E-62 "The Effect of Whey Upon the Operation of an Activated Sludge Plant," Backmeyer, D. P., Proceedings of the 3rd Industrial Waste Conference (1947), Purdue University, p. 310.

This paper discusses the experiences encountered by an activated sludge treatment plant as a result of batch and continuous doses of whey.

E-63 "Effects of Synthetic Detergents on Activated Sludge," Manganelli, R. M., Proceedings of the 4th Industrial Waste Conference, (1948), Purdue University, p. 611.

Laboratory studies were conducted to determine the effects of anionic, cationic and nonionic detergents at various pH levels on activated sludge organisms. The results of these studies are reported in this paper.

E-64 "Some Revised Concepts Concerning Biological Treatment," Sawyer, Clair N. et al., Proceedings of the 9th Industrial Waste Conference (1954), Purdue University, p. 217.

Laboratory studies were conducted to determine the effect on biological treatment of: fluctuating temperature, fluctuating pH levels and starvation periods. The study results are presented in this paper.

E-65 "University of Toronto Studies Reveal Toxic Metals in Sludges Used for Soils," Water and Sewage Works, Vol. 120, No. 7, p. 50 (July, 1973).

Metal concentrations were measured by atomic absorption from three different dried sludge sources: heavily populated and industrialized, residential and a large town with industries-one of which uses chrome. Concentrations for cadmium, chromium, lead, nickel, zinc, iron, manganese and copper from each of the sludges is reported. In recognition of this toxic metals threat, Ontario established guidelines for sludge disposal.

E-66 "Inhibition of Aeration Process: A Quantitative Assessment of Some Toxic Materials," Burrows, M. G., Water Pollution Control, Vol. 68, No. 4, p. 457. (1969)

A method is described by which, it is contended, the cost of treating trade effluents containing inhibitory substances can be developed by the use of laboratory-scale activated sludge units.

E-67 "Some Effects of Zinc on the Performance of Laboratory Scale Activated Sludge Units," Brown, P. and P. R. Andrew, Water Pollution Control, Vol. 71, No. 5, pp. 549-554 (1972).

A laboratory investigation was carried out to determine the effects of zinc on batch type activated sludge units. The test results are presented in this article.

E-68 "Lead-Cadmium and Endotoxin Interactions," Luzio, Nicholas R., Paper presented to the Senate Commerce Committee, Subcommittee on Environment, February 26, 1973.

Laboratory studies were used to determine the effect of lead and cadmium intake in animals on their ability to fight off bacteria. Different animals were used, and lead or cadmium was administrated to the animals along with endotoxins, and the results were reported.

E-69 "Temperature Acclimation in Aerobic Bio-oxidation Systems," Benedict, Arthur H. and D. A. Carlson, Journal of the Water Pollution Control Federation, Vol. 45, No. 1, P. 10 (Jan. 1973).

Laboratory studies were conducted to determine the effects of high and low temperatures on micro-organisms and on performance efficiency of biological treatment systems. Acclimation of mixed cultures at low and at high temperatures were examined.

E-70 "Toxic Effects of Mercury on the Activated Sludge Process," Ghosh, Mriganka, and Paul Zugger, Journal of the Water Pollution Control Federation, Vol. 45, No. 3, p. 424 (March, 1973).

Laboratory studies were conducted to determine the concentrations of mercury that exhibit toxic effects on the activated sludge process. The results of the study are reported in this article.

E-71 "Response of Completely Mixed Systems to Hydraulic Shock Loads," George, Thazhethil, K. and Anthony F. Gaudy, Jr., Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 99, Number EE5, p. 593 (October 1973).

Laboratory tests were used to determine the effects of hydraulic shock loads on activated sludge processes. Two types of shock loads were studied. The first was a constant feed concentration. The second involved a compensating change in feed substrate concentration, so that the daily organic loading remained constant, called "constant daily organic loading." Results of the experiments are given.

E-72 "Response of Activated Sludge to Organic Transient Loadings," Adams, Carl E. and W. Eckenfelder, Jr., Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 96, p. 333 (April 1970).

Laboratory studies were undertaken to evaluate the effects of organic loadings under steady state and transient conditions upon the activated sludge system. Substrate removal and oxygen uptake kinetic models were examined to determine if these equations could be utilized to predict system responses under transient loadings.

E-73 Biological Waste Treatment, Genetelli, E. J., Department of Environmental Sciences, College of Agriculture and Environmental Science, Rutgers University, New Brunswick, New Jersey, 35 pp.

The available methods of biological waste treatment, with their different process modifications are presented. In addition, a discussion on shock loadings (both quantitative and toxic) and their affect on biological systems is included.

E-74 "Toxicity Measurements in Activated Sludge," Hartmann, Ludwig and Gerhard Laubenberger, Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 94, No. 2, p. 247 (April,1968).

This paper discusses different methods of handling toxicity data, and the problems and difficulties that can arise in toxicity measurements. The Michaels and Menten, Warburg, and Lineweaver and Burk Methods are discussed,with laboratory experiments used to demonstrate their application.

E-75 "Toxicity Measurements in Activated Sludge," Closure, Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 96, No. S.A. 2 (April, 1970)

This closure discusses several points from article E-74 concerning the Michaels and Menten equations.

E-76 "Settling Characteristics of Sludge Sedimented from an Industrial Effluent Containing Lead Compounds," Christian, J. R. and D Dollimore, Water Research, Vol. 5, No. 5, p. 177 (1971).

The effect of the presence of oil on the settleability of sludge containing some lead is examined. Laboratory studies examine settling rate, and solids concentration before and after oil removal.

E-77 "Measurement of Toxicity of Industrial Wastes," Banerji, S. K. et. al., Proceedings of the 3rd Mid-Atlantic Waste Conference, p. 305 (1969).

This paper discusses a method for quantitatively assessing the toxicity of wastewater ingredients which affect biological wastewater treatment. The authors use boron as an example to compare the theoretical calculations to the actual laboratory data.

E-78 "Effects of Metallic Ions on Biological Waste Treatment Processes," Reid, George W. et al., Water and Sewage Works, Vol. 115, No. 7, p. 320, (July 1968).

Laboratory studies were conducted to observe the effects of metallic ions on slime and on digester efficiency. The study included various concentrations of chromium, cadmium and copper. Pilot plant studies were carried out to determine the effect of metallic ions on trickling filter BOD removal efficiencies, and on metallic uptake by attached slimes.

E-79 "Effects of Pesticides on Raw Wastewater," Canter, L. W. et. al., Water and Sewage Works, Vol. 116, No. 6, p. 230, (June, 1969).

Laboratory studies are reported which examine the toxic effects of dieldrin, endrin and the organic solvents utilized in commercial pesticide products. Their effects on domestic sewage and on Escherichia coli are also examined.

E-80 "Effects of Heavy Metals on Microorganisms. Application to Process Design," Heck II, Robert P. et. al., Proceedings of the 27th Industrial Waste Conference, (1972), Purdue University.

This paper discusses the use of laboratory monitoring techniques to determine the effects of heavy metals on microorganisms used in biological waste treatment. A discussion of how this data can be applied to process design is also included. Laboratory tests were conducted with copper as the "toxic" material to demonstrate the methods discussed, and the results of the tests are presented.

E-81 "Sulfide Saturation for Better Digester Performance," Masselli, Joseph W. et. al., Journal of the Water Pollution Control Federation, Vol. 39, No. 8, p. 1369 (August, 1967).

Laboratory experiments were conducted to examine the effects of sulfide saturation of digester sludge on gasification. The precipitation of metals to their insoluble sulfides can eliminate metallic shock to anaerobic digestion.

E-82 "Elemental Analysis of Wastewater Sludges from 33 Wastewater Treatment Plants in the United States," Salotto, B. Vincent et. al., from the draft report Proceedings of the Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, Rutgers University, New Brunswick, N. J. (May 21-22, 1974).

Analyses of raw and digested sludges for their metal content are reported in this paper. Statistical distribution, general tendencies, and deviations of the data for 21 metals are included. Comparison of the data with sources outside the United States is made. An analysis of sludge samples for nitrogen, phosphorus, sulfur, and heat of combustion was also made.

E-83 "Effect of Industrial Wastes on Oxidation Pond Performance," Moshe, Meir et. al., Water Research, Vol. 6, No. 10, p. 1165 (Oct. 1972).

Laboratory experiments were conducted to establish the toxicity criteria of different metal ions on oxidation pond operation. Metal ion concentration and pH levels are examined in relation to algal numbers and dissolved oxygen content.

E-84 "Toxic Effects of Cupric, Chromate and Chromic Ions on Biological Oxidation," Lamb A., and E. L. Tollefson, Water Research, Vol. 7, No. 4, p. 599 (April, 1973).

The toxic effects of cupric, chromate and chromic ions under conditions of shock loading on a laboratory activated sludge system are presented. The relationship between toxic effect and suspended solids concentration is also examined.

E-85 "Effect of Temperature on the Removal of NTA (Nitrilotriacetic Acid) during Sewage Treatment," Eden, G. E., et. al., Water Research, Vol. 6, No. 8, p. 877 (August, 1972).

Experiments to determine NTA biodegradation by activated sludge processes are reported. The effects of temperature are also examined to predict the impact of winter conditions on NTA removals.

E-86 "The Role of Sulfide in Preventing Heavy Metal Toxicity in Anaerobic Treatment," Lawrence, Alonzo Wm., and Perry L. McCarty, Journal of the Water Pollution Control Federation, Vol. 37, No. 3, p. 392 (March 1965)

Laboratory studies were performed to determine the effects of copper, zinc, nickel and iron concentrations individually and in combination on anaerobic digestion. The role of sulfide in preventing heavy metal toxicity was also evaluated. The investigation examined sulfide addition as a control procedure to relieve metal toxicity.

E-87 "Resistance of Carcinogenic Organic Compounds to Oxidation by Activated Sludge," Malaney, G. W. et. al., Journal of the Water Pollution Control Federation, Vol. 39, No. 12, p. 2020, (Dec. 1967)

Laboratory studies were conducted to investigate the ability of activated sludge treatment plants to remove carcinogenic compounds from wastewater. The ability of three activated sludges to oxidize selected compounds was tested and the results are presented in this article.

E-88 "The Influence of Trivalent Chromium on the Biological Treatment of Domestic Sewage," Bailey, D. A. et. al., Water Pollution Control, Vol. 69, No. 2, p. 100 (1970)

Pilot plant studies were undertaken to determine concentration levels of trivalent chromium that are acceptable to biological treatment processes. The effects of chromium on digestion, trickling filtration and activated sludge performance were studied and are reported in this article.

E-89 "Biochemical Response of Continuous Flow Activated Sludge Processes to Qualitative Shock Loadings," Komolrit, K. and A. F. Gaudy, Jr., Journal of the Water Pollution Control Federation, Vol. 38, No. 1, p. 85 (January, 1966)

Laboratory studies were conducted to determine the mechanism of substrate interaction in a continuous flow activated sludge system. Variables considered included the combinations and ratios of different substrates, concentration levels and modes of introducing substrates. The shock load responses at various ratios of BOD and Nitrogen were also investigated.

E-90 "The Effect of Kraft Pulp Mill Effluents on the Growth of Zalerion Maritimum," Churchland, L. M. and M. McClaren, Canadian Journal of Botany, Vol. 50, p. 1269 (1972).

Laboratory studies are reported which measured the growth of marine fungus in Kraft pulp mill effluents. A determination of Z.maritimum as an effective decomposer of caustic effluent is also conducted.

E-91 "Tolerance of High Salinities by Conventional Wastewater Treatment Processes," Ludzack, F. J. and D. K. Noran, Journal of the Water Pollution Control Federation, Vol. 37, No. 10, p. 1404 (October, 1965)

This article reports the results of laboratory tests to determine the effects of varying concentrations of chlorides upon activated sludge and anaerobic digestion units during sustained operation. The performance of treatment units were evaluated under slug doses,starvation periods and varied feed rates.

E-92 "The Effects of Surface Active Agents on Aeration," Mancy, K. H. and D. A. Okun, Journal of the Water Pollution Control Federation, Vol. 37, No. 2, p. 212 (February, 1965)

This study analyzed theoretically and experimentally the effect of surface active agents on oxygen transfer kinetics. The article explained how surface active agents interfere with aeration efficiency in waste treatment processes.

E-93 "Effects of EDTA on Wastewater Treatment," Potos, Chris, Journal of the Water Pollution Control Federation, Vol. 37, No. 9, p. 1247 (Sept. 1965)

This paper reports on the research program initiated to determine the effect of EDTA on several components of sewage treatment. Included are the effects of EDTA on secondary sedimentation, coliform numbers, oxygen utilization, wastewater oxidation and chemical coagulation.

E-94 "The Response of Activated Sludge to Nitrogen Deficient Conditions," RamaRao, C. V. et. al., Journal of the Water Pollution Control Federation, Vol. 37, No. 10, p. 1422 (October 1965).

Pilot plant studies were conducted to evaluate modifications of the activated sludge process that would effectively treat nitrogen deficient wastewaters. The purpose of the study was to investigate nitrogen economy in the treatment of certain trade wastes, and the study results are presented in this paper.

E-95 Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes, J. C. Hovious et. al., EPA Bulletin No. PB-222-287, 111 pp. April, 1973.

Laboratory studies were conducted to identify materials that are potentially inhibitory to anaerobic processes using an unacclimated biomass. A number of petrochemical pollutants and their inhibitory concentrations are given.

E-96 "The Effect of Temperature on the Removal of Non-Ionic Surfactants during Small Scale Activated Sludge Sewage Treatment - I," Stiff, M. J. et. al., Water Research, Vol. 7, p. 1003 (1973).

Laboratory studies indicated the differences in biodegradation of three non-ionic surface active materials at 15°C, 11°C and 8°C. Comparisons are made with operating results from a small sewage treatment plant.

E-97 "The Effect of Temperature on the Removal of Non-Ionic Surfactants during Small-Scale Activated Sludge Sewage Treatment - II Comparison of a Linear Alkyl Phenol Ethoxylate with Branched-Chain Alkyl Phenol Ethoxylates," Stiff, M. J. and R. C. Rootham, Water Research, Vol. 7, p. 1407 (1973).

Laboratory studies were conducted to investigate the differences between the biodegradation of a linear alkyl phenol ethoxylate surfactant and two branched-chain alkyl phenol ethoxylates during sewage treatment. Linear alkyl benzene sulphonate (LAS) was also tested to study its removal under varying conditions of temperature.

E-98 "A Mathematical Model for the Continuous Culture of Microorganisms Utilizing Inhibitory Substrates," Andrews, John F., Biotechnology and Bioengineering, Vol. 10, p. 707 (1968).

A mathematical model is presented for both batch and continuous cultures of microorganisms utilizing inhibitory substrates. The model uses an inhibition function to relate substrate concentration and specific growth rate.

E-99 "Effects of Pesticides on Nitrite Oxidation by *Nitrobacteria agilis*," Winely, C. L. and C. L. Clemente, Applied Microbiology, Vol. 19, No. 2, p. 214 (Feb. 1970).

The influence of pesticides on the growth of *N. agilis* in aerated cultures and on the respiration of *N. agilis* cell suspensions and cell-free extracts are presented in this article. The effects of eight pesticides on growth and on nitrite oxidation are also reported.

E-100 "The Influence of Metal Ion Concentrations and pH value on the Growth of a *Nitrosomonas* Strain Isolated from Activated Sludge," Loveless, J. E. and H. A. Painter, Journal of General Microbiology, Vol. 52, (1968).

Laboratory studies were conducted to determine the effects of metal concentrations on the growth of pure cultures, and the consequences of deficiencies of these metals. The effects of pH and temperature are considered. The article includes a literature survey on factors affecting the growth of *Nitrosomonas*.

E-101 "Effect of Chemical Structure on the Biodegradability of Aliphatic Acids and Alcohols," Dias, F. F. and M. Alexander, Applied Microbiology, Vol. 22, No. 6, p. 1114 (December, 1971).

Laboratory studies were undertaken to determine the rate of decomposition of substituted acids by sewage microorganisms. The type, number, and position of the substituents were factors that were considered to determine the susceptibility of a compound to attack.

E-102 "The Effect of Phenols and Heterocyclic Bases on Nitrification in Activated Sludges," Stafford, D. A., Journal of Applied Bacteriology, Vol. 37, p. 75 (1974).

Laboratory studies were conducted to determine the rates of ammonia and nitrite oxidation when various concentrations of phenols or cresols were added to activated sludge. Concentrations at which nitrification is affected are reported in this article.

E-103 "Accumulation of Methanogenic Substrates in CCl_4 Inhibited Anaerobic Sewage Sludge Digester Cultures," Sykes, Robert and E. J. Kirsch, Water Research, Vol. 6, p. 41, (1972).

Laboratory experiments were conducted to determine the effect of carbon tetrachloride (CCl_4) on methane production in sludge digestors. Mechanisms for hydrogen production as a result of methane disruption are also reported.

E-104 "The Toxicity of Cadmium to Anaerobic Digestion: Its Modification by Inorganic Anions," Mosey, F. E. Water Pollution Control, Vol. 70, p. 584 (1971).

A laboratory study was undertaken to investigate the role of the sulphide and carbonate ions in preventing cadmium toxicity in anaerobic digestion. The study investigated steady additions, shock doses, and pH variations to determine their effect on cadmium toxicity. The study results are reported in this article.

E-105 "Factors Affecting the Availability of Heavy Metals to Inhibit Anaerobic Digestion," Mosey, J. D., et. al., Water Pollution Control, Vol. 70, p. 668 (1971).

Laboratory experiments were undertaken to examine the effect of metals on anaerobic digestion. The purpose of the experiments was to explain reported variations in toxic concentrations and the study results are reported. This paper includes a discussion on techniques for measuring metal ions in solution. Procedures are suggested for the prevention and correction of inhibition by metals.

E-106 "Effect of Copper and Hexavalent Chromium On the Specific Growth Rate of Ciliata Isolated from Activated Sludge," Sudo, Ryuichi and Shuichi Aiba, Water Research, Vol. 7, p. 1301 (1973).

The metal concentrations necessary to reduce the growth rate of three species of Ciliata were investigated. Growth rates were determined for both acclimated and non-acclimated cultures.

E-107 "Inhibition of Anaerobic Digestion of Sewage Sludge by Chlorinated Hydrocarbons," Swanwick, J. D. and Margaret Foulkes, Water Pollution Control, Vol. 70, p. 58, (1971).

The toxicity of chlorinated hydrocarbons to anaerobic digestion is investigated. Solids content, proportion of undigested solids, level of bacterial activity and presence of other toxicants have been identified as important variables influencing inhibitory effects.

E-108 The Impact of Oily Materials on Activated Sludge Systems, Environmental Protection Agency, NTIS #PB 212-422, EPA # 12050 DSH (March, 1971)

Small scale continuous activated sludge systems were exposed to a variety of oily compounds at various loading rates to observe the removal performance of the systems. Batch studies were used to determine oil biodegradability, and the effects of emulsification and temperature on biodegradability were also observed.

E-109 "Effect of Toxic Wastes on Treatment Processes and Watercourses," Jackson, S. and V. M. Brown, Water Pollution Control, Vol. 69, p. 292 (1970).

This paper reviews the effects of toxic wastes on aerobic and anaerobic microorganisms and on fish. It identifies the level at which the toxic effects of some substances are likely to be most important. Concentrations are given for materials that are toxic to aerobic, anaerobic and nitrification processes as well as to fish.

E-110 "The Effect of Chloroform in Sewage on the Production of Gas from Laboratory Digesters," Stickley, D. P, Water Pollution Control, Vol. 69, p. 585 (1970).

The toxicity of chloroform contaminated sludge was investigated in laboratory experiments. Continuous and slug doses of chloroform were administered to determine the effect of various concentrations on gas production. The results of the experiments are reported in this article.

E-111 "An Investigation into the Effects of Chlorinated Solvents on Sludge Digestion," Barrett, K. A., Water Pollution Control, Vol. 71, p. 389 (1972).

Gas yields from laboratory digesters that were fed with chlorinated solvents were determined. The effects of steady and shock doses and varying conditions of aeration, temperature, gas recirculation were also examined.

E-112 "Effects of Iron on Activated Sludge Treatment," Carter, John L. and Ross McKinney, Journal of the Environmental Engineering Division, ASCE, Vol. 99, No. EE2, p. 135 (April, 1973).

Laboratory experiments were conducted to relate the iron ion concentration with the rate of biological metabolism. Iron's effect on sludge bulking conditions in waste treatment plants was also examined.

E-113 "Temperature-Toxicity Model for Oil Refinery Waste," Reynolds, James H. et. al., Journal of the Environmental Engineering Division, ASCE, Vol. 100, No. EE3, p. 557 (June, 1974).

Equations have been developed utilizing continuous flow stirred tank reactor kinetics and enzyme inhibition kinetics to describe the effects of temperature on toxicity to microorganisms. These equations were tested by semi-continuous and continuous flow experiments with phenol and the alga Selenastrum Capricornutum.

E-114 "Metal Toxicity to Sewage Organisms," Poon, Calvin P. C. and Kiran Bhayani, Journal of the Sanitary Engineering Division, ASCE, Vol. 97, No. SA 2, p. 161 (April, 1971).

Laboratory experiments were conducted to evaluate the role of metal toxicity in the overgrowth of fungus in the activated sludge process. Pure cultures of Geotrichum candidum and sewage bacteria culture were used to obtain an understanding of the toxic behavior through the use of an enzyme inhibition model.

E-115 "Environmental Effects of Photoprocessing Chemicals," Proceedings of the National Association of Photographic Manufacturers Seminars on Photoprocessing and the Environment, (June, 1974).

A series of papers are contained in these proceedings which cover a broad range of topics pertaining to photoprocessing discharges including: recycling and reuse of chemicals, treatability, properties of photoprocessing wastes, and biological and chemical treatment of photoprocessing effluents.

E-116 "Nitrogen Transformation in Activated Sludge Treatment," Ganczarczyk, Jerzy, Journal of the Sanitary Engineering Division, ASCE, Vol. 97, No. SA 3 (June, 1971).

This article presents the experimental results of full-scale activated sludge treatment of an unbleached kraft pulp mill nutrient-deficient effluent. The experiment was performed to determine the effect of nitrogen deficiency and nitrogen excess on treatment parameters.

E-117 "Industrial Wastes-Chemical Structures Resistant to Aerobic Biochemical Stabilization," Ludzack, F. J. and M. B. Ettinger, Journal of the Water Pollution Control Federation, Vol. 32, No. 11, p. 1173 (November, 1960).

This review presents treatability data of various compounds to facilitate comparisons and clarify relations between chemical structure and microbiological assimilation. Biodegradability of hydrocarbons, alcohols, phenols, aldehydes, acids, salts, esters, ethers, ketones, surfactants, amino acids, nitrogen compounds, vinyl and oxy compounds are tabulated and discussed.

E-118 Interaction of Heavy Metals and Biological Sewage Treatment Processes, U. S. Department of Health Education and Welfare, Environmental Health Series, Water Supply and Pollution Control, Pub. No. 999-WP-22, 201 pp. (May, 1965).

This publication is a collection of 10 research papers originating at the Robert A. Taft Sanitary Engineering Center. The articles describe the effects of chromium, copper, nickel, and zinc on sewage treatment processes. Results of pilot plant studies and full scale municipal plants are given.

E-119 Correlation of Advanced Wastewater Treatment and Groundwater Recharge, Beckman, Wallace J. and Raymond J. Avendt, U. S. Environmental Protection Agency, Project R-801478, Program Element 1BB043, Roap/Task 21 ASB-30.

With regard to a proposed 5 MGD demonstration facility on Long Island, New York, Advanced Wastewater Treatment (AWT) schemes required for reclamation and ground water recharge were evaluated. A review of the theory and practice of AWT and ground water recharge methods is included.

E-120 "Anaerobic Waste Treatment Fundamentals; Part III, Toxic Materials and Their Control," McCarty, P. L., Journal of Public Works, November, 1964.

Four methods of controlling materials toxic to anaerobic waste treatment are proposed. Concentrations of materials that are inhibitory to anaerobic digestion are also presented.

E-121 Water Quality Criteria, Second Edition, McKee, Jack Edwards and Harold W. Wolf, The Resources Agency of California, State Water Resources Control Board, Publication No. 3-A, 548 pp. (1963).

This book is the result of an investigation of technical and scientific literature pertaining to the criteria of water quality for various beneficial uses of water. Included is a condensation and critical evaluation of the literature, and an extensive list of references. A summary of the legal literature is also included.

Discussions on specific pollutants, including radioactivity, pesticides and surface active agents are presented.

E-122 "The Effect of Mercury on the Activated Sludge Process," Zugger, Paul D. and Mringanka M. Ghosh, Proceedings of the 27th Industrial Waste Conference (1972), Purdue University, p. 792.

Laboratory scale aerobic batch cultures of microorganisms, similar to those found in the activated sludge treatment process, were used to determine the effects of slug doses of mercury on activated sludge systems. A table which includes the 96 hour median tolerance limit in fish for certain metals is also indicated. A description of the laboratory equipment, procedures, and results is presented.

E-123 "A Discussion on Inhibition of Anaerobic Digestion of Sewage Sludge by Chlorinated Hydrocarbons," Swanwick, J. D. and Margaret Foulkes, Water Pollution Control, Vol. 70, p. 573, (1971).

This paper is a discussion of article E-107.

E-124 "Organic Load and the Toxicity of Copper to the Activated Sludge Process," Salotto, B. V. et. al., Proceedings of the 19th Industrial Waste Conference (1964), Purdue University, p. 1034

Activated sludge pilot plant studies investigated the effect of organic loading on the toxicity and distribution of copper in the various treatment processes. The effects of two copper concentrations (one and five mg/l) were studied at each organic loading condition. Determinations of COD, suspended solids, BOD, turbidity and copper at various outlets were used to measure these effects. The ultimate fate of copper is examined.

E-125 "Anaerobic Processes," Ghosh, S. and F. G. Pohland, Journal of the Water Pollution Control Federation, Vol. 42, No. 6, p. 920 (June 1970).

This article reviews the 1969 literature on anaerobic processes as they pertain to wastewater treatment. Included are reviews of microbiology and mechanisms of the process, process developments and kinetics, analytical methods and control, and process applications.

E-130 Hexane Extractable Materials and Problems at Municipal Treatment Plants, Metropolitan Sanitary District of Greater Chicago, Department of Research and Development, Report No. 75-9, May, 1975.

Data on the treatability and fate of Hexane Extractable Materials (oil and grease) as observed at MSD treatment facilities are presented. Accounts of operational problems and secondary effects on sludge disposal are also reported.

E-131 Treatability of Oil and Grease Discharged to Publicly Owned Treatment Works, USEPA, #440/1-75/066, April, 1975.

The general nature of oil and grease in wastewater is presented in this document. The effects of oil and grease on the removal capabilities of various wastewater treatment processes is also described.

E-132 "U. S. Environmental Protection Agency Policy on Municipal Sludges," Whittington, W. A., and B. L. Seabrook, prepared for U.S./U.S.S.R. Seminar, Handling, Treatment and Disposal of Sludges, Moscow, U.S.S.R.

This summarizes EPA's Technical Bulletin, Acceptable Methods for the Utilization of Disposal of Sludges. This paper also describes the important factors to consider for planning sludge management programs.

E-133 Proceedings of the Joint Conference on Recycling Municipal Sludges and Effluents on Land, Champaign, Ill., July 9-13, 1973.

This document contains reprints of more than two dozen papers concerned with recycling of sludge and effluents by land application. A broad range of topics pertinent to this subject are discussed in detail.

E-134 Proceedings of the National Conference on Municipal Sludge Management, Pittsburgh, Pa., June 11-13, 1974.

More than two dozen papers are presented on all aspects of municipal sludge management, including specific information on substances present in trace amounts in sewage sludges.

E-126 "Toxic Effects of Ammonia Nitrogen in High-Rate Digestion," Melbinger, N. R. and J. Donnalion, Journal of the Water Pollution Control Federation, Vol. 43, No. 8, p. 1658 (August, 1971).

Case studies are reported on two digesters that were upset from the rate of nitrogen ammonia formation. Methods of digester recovery and nitrogen ammonia control are discussed. A discussion by H. Zablatzky follows this article and includes a review of nitrogen ammonia effects on biological treatment.

E-127 "Anaerobic Processes," Ghosh, S., Journal of the Water Pollution Control Federation, Vol. 45, No. 6, p. 1063 (June, 1973).

This article reviews the 1972 literature on anaerobic processes as they pertain to wastewater treatment. Included are reviews of microbiology and mechanisms of the process, toxicity and inhibition, process developments and control, and process applications.

E-128 "Effect of Boron on Anaerobic Digestion," Banerji, S. K. and P. R. Parikh, Proceedings of the 4th Mid-Atlantic Industrial Waste Conference (1970).

Laboratory scale tests were used to determine the effect of boron on anaerobic digestion. Doses from 1-3 mg/l boron fed as boric acid was tested on a glucose and acetate fed batch digester. The analytical techniques and the results of the experiments are discussed.

E-129 Correlation of Advanced Wastewater Treatment and Ground Water Recharge, Beckman, W. J., and R. J. Avendt, prepared for U. S. Environmental Protection Agency, Office of Water Program Operations.

This document reviews advanced wastewater treatment processes and their applicability to renovation of wastewater for ground water recharge. Included is a detailed discussion of the nitrification processes, and the effects of certain inhibitory substances.

E-135 Wastewater Treatment and Reuse by Land Application, Volume I - Summary, Volume II, Report, U. S. EPA, #660/2-73-006, August, 1973.

These booklets present the results of a nationwide study on current practices of land application of municipal treatment plant effluents and industrial wastes. Land application techniques, such as irrigation, overland flow and infiltration-percolation are described, and the results from operational systems are indicated. Climate, health, and economic considerations are also addressed by the study.

E-136 Review of Landspreading of Liquid Municipal Sewage Sludge U.S. EPA, #670/2-75-049 GPO Stock No. 055-001-01024, 96 pp.

This study reviews the state-of-the-art of landspreading of liquid municipal sewage sludge. The information was obtained from a questionnaire sent to 1900 sewage treatment plants and from available literature. The subjects discussed in the booklet include sludge characteristics, sludge handling, economics of landspreading, sludge-soil-plant interactions, public health considerations and land acquisition.

E-137 Renovation of Secondary Effluent for Reuse as a Water Resource, U. S. EPA, # 660/2-74-016, February, 1974, 495 pp.

Land application of secondary treated, chlorinated wastewater is described in this study. 500,000 gpd of water was applied to cropland and forestland by means of sprinkler irrigation. The effect of the water on crop yields and crop composition was studied and is reported. Other factors that were considered included the quantity and quality of recharge to the ground water and the costs of spray irrigation systems.

E-138 Evaluation of Land Application Systems, U.S. EPA, # 430/9-75-001, March, 1975, 181 pp.

This document offers guidance on how land application of sewage treatment effluent should be incorporated into regional planning studies. A checklist of factors to consider is presented with background

E-138 (continued)

information to aid in their evaluation. The document is divided into sections on wastewater management plans, design plans and specifications, and operation and maintenance manuals.

For additional information pertaining to this section, please refer to the following articles.

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SECTION F - REMOVAL OF POLLUTANTS IN PUBLICLY OWNED TREATMENT WORKS

Reference: Volume I, Section F
Volume II - Appendix 6

F-1 "Acclimation of Microorganisms for the Oxidation of Pure Organic Chemicals", Mills, E.J., Jr. and Vernon T. Stack, Jr., Proceedings of the 9th Industrial Waste Conference, (1954) Purdue University, p. 449.

This paper presents the results of tests to determine the acclimation of microorganisms to selected organic compounds. The microorganisms were taken from the Kanawha River in West Virginia, and the organic compounds considered consisted of amines, butyl carbitol acetate, acetanilide, acrylonitrile and glycols.

F-2 "Activated Sludge Treatment of Cyanide, Cyanate and Thiocyanate", Ludzack, F.J. and R. B. Schaffer, Proceedings of the 15th Industrial Waste Conference, (1960) Purdue University, p. 439.

Laboratory tests were performed on test feeds composed of cyanides, cyanates and thiocyanates to determine the biological treatability of each. The nature of degradation mechanism was examined, and the responses to several variables were studied. Acclimation of the activated sludge, loading rates and efficiencies were also indicated for each compound.

F-3 "Metabolism of Organic Sulfonates by Activated Sludge", Symons, James M. and L. A. Del Valle-Rivera, Proceedings of the 16th Industrial Waste Conference, (1961) Purdue University, p. 555.

This article presents the results of laboratory tests to determine the mechanism of biological degradation of aromatic sulfonates (synthetic detergents) by activated sludge. The relationship between the structure of a compound and its biodegradability for various sulfonates is studied.

F-4 "Biological Oxidation of Phenols in a Trickling Filter", Graves, B.S., Proceedings of the 14th Industrial Waste Conference, (1959), Purdue University, p.1.

This paper indicates the results of adding phenols to a domestic waste stream, and how the phenols are removed by a conventional secondary (trickling filter) treatment plant.

F-5 "Experimental Treatment of Organic Cyanides by Conventional Sewage Disposal Processes", Ludzack, F.J., et.al Proceedings of the 14th Industrial Waste Conference, (1959) Purdue University, p. 547.

A bench scale activated sludge unit was used to test the treatability of nitriles and their effect on the activated sludge. The effect of nitriles on anaerobic digestion was also presented. Results of acclimation tests with various nitriles and alternate methods of removing nitriles were also discussed.

F-6 "Evaluating Treatability of Selected Industrial Wastes", Jorden, William L. et. al, Proceedings of the 26th Industrial Waste Conference, (1971), Purdue University, p. 514.

This paper presents a procedure for evaluating treatability of industrial wastes using a continuous flow, bench scale completely mixed, slurry reactor. The theory of mixed systems and the equipment and procedure recommended is outlined, as are the results of treatability tests. The purpose of these tests is to utilize the results as a design basis for treatment plants.

F-7 "Treatability of Wastewater from Soluble Coffee Manufacturing", Hammer, Mark J., et. al, Proceedings of the 26th Industrial Waste Conference, (1971), Purdue University, p. 348.

This article examines the treatability of soluble coffee manufacturing wastes, separately and jointly with domestic waste. The waste characteristics are presented for the coffee wastes, and the bulking effect on activated sludge that the coffee causes is examined.

F-8 "Performance of Regionally Related Wastewater Treatment Plants", Adams, B.J. and R. S. Gemmel, Journal of the Water Pollution Control Federation, Volume 45 No. 10, p. 2088 (October, 1973)

The variation of plant performance data for activated sludge plants in the Chicago area is contained in this article. A statistical analysis of the BOD, SS, and DO in the discharge of the plants is also presented.

F-9 "Treatment of Combined Aircraft Overhaul and Domestic Wastes", Rhodes, G. H., et. al., Journal of the Water Pollution Control Federation, Volume 45, No. 12, p. 2549 (December, 1973)

The Jacksonville Naval Air Station had been treating industrial wastes and domestic wastes separately, and neither discharge had met local standards. A study was undertaken to consider joint treatment of these wastes. The procedure used in the study is presented in this article. The characteristics of both waste streams and operating results from the combined treatment plant are contained.

F-10 "Stability and Removal of Commercial Dyes from Process Wastewater", Porter, John J., Pollution Engineering, Vol. 5, No. 10, p. 27, (October, 1973).

This article presents a description of commercial dye characteristics and their rate of degradation in water. The effect of various waste treatment systems (biological, reverse osmosis, carbon adsorption, coagulation, radiation-oxidation and lime precipitation) on dyes is explored.

F-11 "Industrial Wastes Treated by Activated Sludge", Clinton, M.O., Proceedings of the 11th Industrial Waste Conference, (1956), Purdue University, p. 88.

A general discussion of how two Wisconsin municipal sewage treatment plants upgraded themselves through activated sludge to meet the increased discharges from local food processing plants is presented.

F-12 "Removal of Low-Level Radioisotopes from Wastewater by Aerobic Treatment", Lawrence, C. H. and F. W. Gilcress, Journal of the Water Pollution Control Federation, Vol. 37, No. 9, p. 1289 (September, 1965)

Pilot plant removal studies of low-level radionuclides from wastewater are presented. The removal of various radioactive chemicals by primary sedimentation, trickling filtration, secondary sedimentation and lagooning was measured. The mechanism of removal was explored and the effect of radioactive materials on treatment plant efficiency was examined.

F-13 "How to Treat Polystyrene Wastewater", Mason, Wallace and Gerald S. Allen, Industrial Wastes, September/October 1974 p. 31.

A process description of two pretreatment plants treating polystyrene wastewater is presented. Influent and effluent data, sludge disposal data and general cost information is included.

F-14 "Biodegradation of Oleates", Williams, J. and E. O. Bennett, Journal of the Water Pollution Control Federation, Vol. 45, No. 8, p. 1671 (August, 1973).

A laboratory study investigating the biodegradability of commercially available oleates and hydroxyoleates is presented. Degradation was determined by the growth of P. aeruginosa. Factors influencing biodegradation, such as oleate concentration, metal interference and purity of the substrate are investigated for a variety of oleates.

F-15 Evaluation of Processes Available for Removal of Phosphorus from Wastewater, Cecil, Lawrence K., U. S. EPA Contract #14-12-581, EPA No. 17010 DRF, July, 1972.

The most important phosphate removal processes (biological, lime, aluminum and iron) are evaluated for a variety of criteria. The points of application of phosphate removal processes in existing and new facilities are discussed with the alternative sludge disposal methods. A partial list of treatment plants where phosphorus removal capability exists, or is planned, is presented, including capacity, type of removal and P level in the effluents. A short capital and operating cost section is included.

F-16 "The Factor of Treatability as Applied to Industrial Effluents", Finch, John, Water Pollution Control, Volume 66, Number 2, p. 141 (1967).

This article reviews some of the literature on the interrelationships between industrial discharges and municipal plants. Some guidelines for dealing with administrative problems are also included.

F-17 "Biological Degradation of Wastes Containing Certain Toxic Chemical Compounds", Howe, Robert H.L., Proceedings of the 16th Industrial Waste Conference, (1961) Purdue University, p. 262.

The biological degradation of several pharmaceutical wastes is discussed in this paper. The results of some laboratory scale and some actual plant removals of antibiotics, phenol-mercury compounds, hormones and organics containing formaldehyde and methyl alcohol are presented. The toxicity and inhibitory effects of some of these compounds are also indicated.

F-18 "Pretreatment of Toxic Wastes", Chalmers, R. K., Water Pollution Control, Volume 69, p. 281 (1970)

This general article discusses the problems of toxic wastes and what pretreatment alternatives are available to reduce or eliminate toxic discharges.

F-19 "Constraints to Spreading Sewage Sludge on Cropland", U. S. EPA, News of Environmental Research in Cincinnati, May 31, 1973.

This article discusses the parameters that limit the use of sewage sludge on cropland. Factors which are considered include nitrogen, metals, pathogens, odors, etc. The areas where research and guidance are needed are outlined.

F-20 "The Biochemical Oxidation of Synthetic Detergents", Bogan, R.H. and C. N. Sawyer, Proceedings of the 10th Industrial Waste Conference, (1955), Purdue University, p. 231

A laboratory study utilizing the Warburg apparatus and the standard 5-day BOD test was conducted to determine the biochemical oxidation of a selected group of anionic and nonionic detergents. Acclimation of various activated sludge seeds was also discussed.

F-21 "The Aerobic Metabolism of Potassium Cyanide", Nesbitt, John B, et.al., Proceedings of the 14th Industrial Waste Conference, (1959), Purdue University, p. 518.

A laboratory scale experiment was conducted to determine the feasibility of biological treatment of cyanide wastes. The cyanide waste stream was treated by activated sludge in the absence of sewage, and removal data was presented.

F-22 "Fate and Effects of Trace Elements in Sewage Sludge When Applied to Agricultural Lands", U.S. EPA Bulletin, EPA 670/2-74-005 (January, 1974).

The first part of this bulletin compiles and reports the results of published material dealing with the subject title. The second part explores the potential impact of sludge applications to land, including a review of the effect of various trace metals on crops and soils.

F-23 "The Treatment of Effluents from a Chrome Side Leather Tannery on a Conventional Biological Filter", Bailey, D. A., et.al., Water Pollution Control, Vol. 71, No. 2, p. 202 (1972).

Bench scale and pilot plant experiments indicated that biological treatment can reduce the BOD of mixed effluents from a chrome side leather tannery to values acceptable to authorities in England. Various pretreatment techniques were presented, and parameters discussed included chromium, sulfide and sludge produced. The data generated can be used to compare pretreatment with the cost of discharging to a municipal plant.

F-24 "New England Examples of Joint Treatment of Municipal and Industrial Wastewaters", Parker, William H., III, Presented at the 47th Annual Conference of the WPCF, Denver, Colorado, (October, 1974)

This paper lists the advantages and disadvantages of joint treatment and discusses sewer ordinances. Case histories of engineering studies for Fitchburg, Mass., Springfield, Mass., Concord, N. H., Lewiston-Auburn, Maine, and Adams, Mass. are presented and conclusions of joint studies are also presented.

F-25 "A Guide to the Selection of Cost-Effective Wastewater Treatment Systems", Van Note, R. H., et.al., U.S. EPA Contract No. 68-01-0973, (May, 1973).

Flow sheets describing various unit processes associated with wastewater treatment and sludge handling are presented. Curves depicting total cost in cents per thousand gallons of influent wastewater are shown for plant capacities ranging from 1-100 MGD.

F-26 "Removal of Metals by Physical and Chemical Treatment Processes", Maruyama, T., et. al., presented at the 45th Annual Conference of the Water Pollution Control Federation, Atlanta, Georgia, October, 1972.

Pilot scale tests of coagulation, sedimentation, filtration and carbon adsorption are evaluated to determine their removal capability on metals and toxic substances. A discussion of metals removal in conventional treatment processes is also contained.

F-27 "Sources of Metals in New York City Wastewater", Klein, L.A., et.al., Journal of the Water Pollution Control Federation, Vol. 46, p. 2653 (December, 1974).

Removal information from 12 New York City POTW's is presented. Copper, chromium, nickel, zinc and cadmium removal data were based on daily flow proportioned samples combined into monthly composites. The results from 21 monthly averages are presented.

F-28 "Regulating Latex Paint Wastes", Williams, Rodney, T.,
Part 1 - Industrial Wastes, July/August 1974, p. 34.
Part 2 - Industrial Wastes, Sept./Oct., 1974, p. 36.

The treatability of latex paint wastes in East Bay Municipal Sewer District, Oakland, California, was determined by jar test methods, with the general conclusion that this waste is treatable by activated sludge and chemical coagulation, either at the source or at the POTW. A user charge system example is detailed.

F-29 "Heavy Metals Removal at Conventional Secondary Treatment Plants", Altschuler, M. and G. Otakie, EPA, internal correspondence, December 20, 1974.

Operating data from POTW's in Byron, Ohio; Grand Rapids, Michigan; Richmond, Indiana, and Rockford, Illinois are presented. These data were extracted from an HEW Report entitled, "Interaction of Heavy Metals and Biological Sewage Treatment Processes", (1965). Data from Alcosan and Muncie, Indiana POTW's are presented and were extracted from "Introduction of Heavy Metals to Wastewater in Three Urban Areas", by J. A. Davis, et.al (1974). The information is correlated and a discussion of inhibitory effects is presented.

F-30 "Removal of Heavy Metals by Wastewater Treatment Plants", Esmond, S.E., and A. C. Petrasek, Jr., Paper presented at Water and Wastewater Equipment Manufacturers Association, Industrial Water and Pollution Conference and Exposition, Chicago, Illinois, March 14-16, 1973.

Dallas Demonstration Plant (1 MGD) removal data for 12 metals is presented for two treatment processes: an activated sludge process fed by primary effluent, followed by multimedia filtration, and the same activated sludge process, followed by high-lime treatment, multimedia filtration and granular activated carbon adsorption. Four month average data is presented.

F-35 Development of a Chemical Denitrification Process, Gunderloy, Frank C. et. al., EPA, NTIS NO. PB 203 597 72 pp., October, 1970.

Laboratory studies of the denitrification process based on the copper catalyzed ferrous ion reduction of nitrate ion in basic media were conducted. The purpose was to determine the effects of process variables on the extent of reduction, and on product distribution. Study results are presented in this article.

F-36 Biological Treatment of Chlorophenolic Wastes. The Demonstration of a Facility for the Biological Treatment of a Complex Chlorophenolic Waste. Jacksonville, Ark. NTIS No. PB 206 813, 187 pp., June, 1971.

Pilot plant studies were conducted to determine the biodegradability of chlorophenolic wastes under actual field conditions. Herbicide wastes were treated jointly with municipal wastes in an aerated lagoon located between a conventional sewage treatment plant and a stabilization lagoon. The purpose of this project was to finalize the design, construction and operation for joint treatment of an industrial waste and a municipal waste. The study included biological, chemical, hydraulic and overall considerations.

F-37 "Treatment of a Combined Wastewater by the Low-Lime Process," Tofflemire, T. J. and Leo J. Hetling, Journal of the Water Pollution Control Federation, Vol. 45, No. 2, p. 210, (February, 1973).

This article presents the results of a study to investigate the treatability of a 50:50 mixture of domestic waste and paper mill waste. The studies were conducted on an actual waste flow in Waterford, N. Y. Conclusions and recommendations are both presented.

F-38 "Characteristics of Municipal Effluents,"Pound, Charles, and Ronald W. Crites, Conference on Recycling Municipal Sludges and Effluent, Champaign, Ill., July 9-13, 1973.

Physical, chemical, and biological characteristics of municipal wastewaters are presented and discussed. Constituents of raw wastewater and plant effluent are presented for four types of waste treatment plants. The wastes are compared to acceptable irrigation waters.

F-31 "Treatment Plant Designed for Anticipated Standards," Schwinn, Donald E., Public Works, Vol. 104, No. 1, p. 54 (January, 1973).

This article reports on the design and construction of a wastewater treatment plant for the District of Columbia. In addition to primary and secondary treatment facilities, plans include provisions for nitrogen and phosphorus removal.

F-32 "Degradation of a Cationic Surfactant in Activated Sludge Pilot Plants," Fenger, Bert H. et. al., Water Research, Vol. 7, p. 1195 (1973).

Pilot plant activated sludge studies were used to describe and demonstrate the degradation of cationic surfactants. Tetradecylaimethyl- benzlammonium chloride (TDBA) was chosen as a representative surfactant. The removal of TDBA was studied, and the conditions which affect removal, such as protein presence, volumetric loading and temperature were noted. The inhibition of non-acclimated activated sludge and the effect of shock loadings of TDBA were also investigated.

F-33 "Trace Elements in Sewage Sludges," Berrow M. L. and J. Webber, Journal of the Science of Food and Agriculture Vol. 23, p. 93, (June, 1972).

The article presents an analysis of dried sewage sludges from 42 rural and industrial towns in England and Wales. The levels of various metals in the sludges and in the soil are compared, and related to toxicity of vegetation.

F-34 "Biological Treatment of Cyanides, With and without Sewage," Pettet, A. E. J. and E. V. Mills, Journal of Applied Chemistry, August 4, 1954.

This article discusses the results of a laboratory test used to determine the effect of cyanides on treatment of sewage with percolating filters.

F-39 A Characterization of Heavy Metals in Sewage and in the Background Environment, Clough, Kerrigan, G., U. S. EPA, NERC - Cincinnati, June 15, 1972.

This report is a summary of the current knowledge regarding environmental contamination by metals. Major emphasis is given to metal concentrations in sewage effluents.

F-40 "Physical-Chemical Wastewater Treatment at Niagara Falls, N. Y. and Fitchburg, Mass.," Woodward, Richard L., AIChE Symposium Series, Vol. II, Municipal Waste Treatment (1974).

This paper discusses the reasons for selection of physical-chemical treatment and the design criteria used at the two sites. The Niagara Falls plant is 48 mgd, and the Fitchburg plant is 15 mgd.

F-41 "Status Report on Niagara Falls AWT Facilities," Siriani, Josef, and Robert C. Marini, presented at the New York Water Pollution Control Association, Winter Meeting, January 22, 1974.

This paper presents the background history of the Niagara Falls Project. A description of the original pilot plant, design and construction of the full scale plant and industry's involvement and responsibility to the plant are all discussed.

F-42 Wastewater Treatment Technology, Patterson, J. W. et. al., State of Illinois Institute for Environmental Quality, 300 pp., August, 1971.

This report covers twenty-two chemical substances, and discusses their sources and treatment techniques. A general summary for each chemical, with references is also included.

F-43 "Rate of Phosphorus Uptake by Activated Sludge," Wells, W. N., Water and Sewage Works (January, 1975).

This article describes an experiment to measure the phosphorus uptake by the activated sludge process. Experimental results are presented.

F-44 "Polychlorinated Biphenyls in Treatment Plant Effluents," Dube, Douglas J. et. al., Journal of the Water Pollution Control Federation, Vol. 46, No. 5, p. 966 (May, 1974).

A survey of polychlorinated biphenyls (PCB) in southeastern Wisconsin municipal wastewater treatment plants was conducted. Gas chromatogram patterns were matched to those for Aroclor 1254. Concentrations were given for influent and effluent from several treatment plants.

F-45 "Treatment of Oily and Metal Containing Wastewater," Lin Y. H. and J. R. Lawson, Pollution Engineering, Vol. 5, No. 11, p. 45 (November, 1973).

This article presents a series of tables which detail the sources, characteristics and treatment alternatives for oily wastes, often containing toxic metals. Removal efficiencies and effluent concentrations of BOD, oil and suspended solids for characteristic waste streams are indicated for several treatment processes.

F-46 "Joint Treatment vs. Pretreatment of Food Processing Wastes," Watson K. S. et. al., Journal of the Water Pollution Control Federation, Vol. 46, No. 8, p. 1927 (August, 1974).

The compatibility of dairy and food processing wastes with municipal sewage is discussed in this article. The operational and economical advantages of joint treatment over separate treatment are indicated. A successful example of joint treatment at a cheese manufacturing plant in Lowville, N. Y. is also presented.

F-47 "New Lake at South Lake Tahoe, California," Wakeman, R., Water and Sewage Works, Vol. 115, No. 8, p. 348 (August, 1968).

Removal efficiencies for BOD, COD, suspended solids, turbidity, phosphates, ABS and coliform are presented for the secondary and advanced portions of the South Lake Tahoe sewage treatment plant.

F-48 "Wastewater Treatment Lures Industry," Larson R. L., The American City, November, 1971, p. 74.

A wastewater treatment facility has been built in Plant City, Florida to handle domestic sewage and waste from food processors and other industries. The key to the treatment program is an industrial waste ordinance, requiring industries to provide facilities for sampling, measuring flow, determining pH and temperature, and providing pre-treatment in the form of bar screens and pH adjustment.

F-49 "City - Industry Teamwork Solves Critical Wastewater Problems," Forestell, William L., The American City, July , 1973, p. 57.

The South Charleston Waste Treatment Works receives petrochemical wastes from a large chemical plant and domestic sewage from South Charleston, Separate primary treatment is provided for each waste, and the wastes are combined for secondary treatment. The details of the plant operation and the BOD removals are reported in this article.

F-50 "Regional Plant Solves Small-Town Wastewater Problem," Cuttica H. C. and R. A. Armstrong, The American City, July , 1974, p. 31.

Two New York cities joined forces to form the Gloversville - Johnstown Sewer Board and build a treatment plant to handle domestic sewage and wastes from more than two dozen industries, including 20 tanneries, 3 textile dyeing plants, and a large glue factory. The 13 mgd plant uses two-stage biological treatment. The first stage is a high-rate trickling filter and the second stage is activated sludge. Removal of BOD and suspended solids has exceeded 90 percent.

F-51 "Trace Metals in Wastewater Effluents," Chen K. Y. et. al., Journal of the Water Pollution Control Federation, Vol. 46, No. 12, p. 2663 (December, 1974).

An intensive study was conducted at the Hyperion Treatment Plant in Los Angeles to characterize trace metals in the effluents of various treatment processes. The partition of the metals into dissolved and particulate phases, and the size distribution of the particulate borne fractions in wastewater effluents and digested sludge were studied.

F-52 "Carbon Treatment of a Municipal Wastewater," Burns, D. E. and G. L. Shell, Journal of the Water Pollution Control Federation, Vol. 46, No. 1, p. 148 (January, 1974).

A pilot plant study was conducted in Salt Lake City to evaluate the use of activated carbon to remove soluble organic matter from municipal wastewaters. Carbon treatment in conjunction with chemical treatment was also studied.

F-53 "Effects of Equalizing Wastewater Flows," La Grega M. D. and John D. Keenan, Journal of the Water Pollution Control Federation, Vol. 46, No. 1, p. 123 (January, 1974).

A study was conducted in Newark, N. Y. to determine the effects of maintaining a constant flow of wastewater on treatment plant operation. An equalization tank was used, and the effluent characteristics from constant flow and variable flow conditions were compared.

F-54 Stability and Control of Anaerobic Digestion," Graef S. P. and Andreurs J. F., Journal of the Water Pollution Control Federation, Vol. 46, No. 4, p. 666 (April, 1974).

A computer was used to simulate the response of an anaerobic digestor to organic, toxic and hydraulic overloading. The factors that influence process stability and the indicators of impending digestor failure were also studied.

F-55 "Adsorption of MBAS from Wastewaters and Secondary Effluents," Rickert, D. A. and J. V. Hunter, Journal of the Water Pollution Control Federation, Vol. 46, No. 5, p. 911 (May, 1974).

Methylene blue active substances (MBAS) can be divided into three groups on the basis of adsorption characteristics. The behavior of each group and their interaction with organics present in wastewater are presented in this article.

F-56 "Biodegradability and Treatability of Combined Nylon and Municipal Waste," Poon C. P. C., Journal of the Water Pollution Control Federation, Vol. 42, No. 1, p. 100 (January, 1970).

A laboratory study was conducted to determine the feasibility of treating combined nylon and municipal wastewaters. Nylon wastes contain high organic levels, solvents and low pH. The most efficient operating parameters and the potential of solvent recovery are reported.

F-57 "Anionic Detergents in Wastewater Received by Municipal Treatment Plants," Barth E. F. and M. B. Ettinger, Journal of the Water Pollution Control Federation, Vol. 39, No. 5, p. 815 (May, 1967).

An 18 month study of 5 treatment plants to determine the removal of methylene blue active substances (MBAS) is presented in this article. The correlation of MBAS removals and COD removals is also indicated.

F-58 "Heavy Metal Uptake by Activated Sludge," Cheng, M. H. et. al., Journal of the Water Pollution Control Federation, Vol. 47, No. 2, p. 362 (February, 1975).

This article discusses the mechanism by which activated sludges remove metals from wastewaters. The factors which influence removal and the variation among different metals are also presented.

F-59 "Heavy Metal Removal by Acclimated Activated Sludge," Neufeld Ronald D. and Edward R. Hermann, Journal of the Water Pollution Control Federation, Vol. 47, No. 2, P. 310 (February, 1975).

This article discusses the removal efficiencies of activated sludges that have been acclimated to levels of mercury, cadmium and zinc up to levels of 1000 mg/l. Biomass production, respiration parameters and kinetic parameters are also indicated as a function of metal-sludge ratio.

F-60 "Efficiency of Heavy Metals Removal in Municipal Sewage Plants," Brown H. G. et. al., Environmental Letters, Vol. 5, No. 2, p. 103 (1973).

During the first half of 1972 six municipal sewage treatment plants were routinely monitored to determine the efficiency of metals removal. The plants chosen encompassed primary, trickling filter and activated sludge treatment in various size municipalities. The metals that were measured in the influent and effluent were cadmium, chromium, copper, zinc and lead. The removal efficiency for each metal and the relationship between metals removal and suspended solids removal are discussed in this article.

F-61 "The Fate of Chromium during the Treatment of Sewage," Stones, T., Journal of the Institute of Sewage Purification, 1955, p. 345

This article discusses the concentration changes that chromium undergoes during various unit operations of sewage treatment. Operations discussed include sedimentation, chemical precipitation, biological filtration and activated sludge treatment.

F-62 "The Fate of Copper During the Treatment of Sewage," Stones, T., Journal of the Institute of Sewage Purification, 1958, p. 82.

The effects of sedimentation, chemical precipitation, biological filtration and activated sludge treatment on copper concentration changes are described in this article.

F-63 "The Fate of Nickel during the Treatment of Sewage," Stones, T., Journal of the Institute of Sewage Purification, 1959, p. 252.

This article indicates how nickel concentration is affected by sedimentation, chemical precipitation, biological filtration and activated sludge treatment.

F-64 "The Fate of Zinc during the Treatment of Sewage", Stones, T. Journal of the Institute of Sewage Purification, 1959, p. 254.

Zinc concentration changes have been studied during sedimentation, biological filtration, chemical precipitation and activated sludge treatment. The study results are reported in this article.

F-65 "The Fate of Lead during the Treatment of Sewage," Stones, T., Journal of the Institute of Sewage Purification, 1960, p. 221.

This article discusses the concentration changes that lead undergoes during treatment by sedimentation, biological filtration, chemical precipitation and activated sludge.

F-66 "Fate of Heavy Metals in Physical-Chemical Treatment Processes," Argaman, Y. and C. C. Weddle, AIChE Symposium Series - Water, 1973.

Results are presented from a series of pilot plant studies on the removal of heavy metals using physical-chemical wastewater treatment processes. The processes investigated were lime precipitation, ferric chloride precipitation, dual media filtration, and activated carbon adsorption. The effect of nitrilotriacetic acid (NTA) on heavy metal removal efficiencies was also investigated.

F-67 Feasibility of Joint Municipal and Industrial Wastewater Treatment in the Onondaga Lake Watershed, Onondaga County, New York, Roy F. Weston, Inc., Final Report FWPCA Grant No. WPRD 66-01-68, September, 1970.

Bench scale activated sludge studies were conducted at the Metropolitan Sewage Plant to determine heavy metals removal. The results of these studies are presented in this report.

F-68 "Treatment of Coke Plant Phenolic Wastes in a Municipal Activated Sludge Plant," Mathews W. W., *Proceedings of the 13th Industrial Waste Conference* (1968), Purdue University.

The Gary, Indiana Sanitary District conducted an experiment to determine the effectiveness of phenol reduction by the activated sludge process. The results of this experiment are presented in this paper, including all of the monthly operating data from the plant.

F-69 "Nutrient Removals by Conventional Treatment Processes," Johnson W. K., *Proceedings of the 13th Industrial Waste Conference* (1958), Purdue University.

This paper presents a literature survey and operating data on the nitrogen content of raw sewage, and nutrient removals in primary, chemical and biological treatment plants.

F-70 "Design and Early Operating Experience of Activated Sludge Plant for Combined Treatment of Pulp, Paper and Domestic Waste," Coughlan F. P. Jr. and A. E. Sparr, *Proceedings of the 16th Industrial Waste Conference*, (1961) Purdue University, p. 375.

A secondary sewage treatment plant at Westernport, Maryland treats both kraft pulping wastes and domestic sewage. Some of the early operating experiences of this plant, including some removal characteristics, are presented in this article.

F-71 "Designing a Combined Treatment Works for Municipal Sewage and Packinghouse Wastes at Austin, Minnesota," Hill, Kenneth V., *Proceedings of the 13th Industrial Waste Conference* (1958), Purdue University, p.260

This article describes the design of a sewage treatment plant for municipal and packinghouse wastes. Operating data and its comparison to design data for a similar plant is also presented.

F-72 "Treatability of Industrial Wastes in Combination with Domestic Sewage," Sawyer C. N. and P. A. Kahn, Proceedings of the 13th Industrial Waste Conference (1958), Purdue University, p. 341.

This article is a general discussion of factors which affect treatability of combined wastes. Factors discussed include inert solids, fibrous materials, oils and greases, floating materials, flow variations, thermal variations, density variations, pH, toxic materials, BOD load variations, nutritional requirements, ferrous compounds, and odor-producing ingredients.

F-73 "BOD of Synthetic Organic Chemicals," Lamb C. B. et. al. Proceedings of the 11th Industrial Waste Conference (1956), Purdue University, p. 326.

This article presents the BOD values of a wide range of synthetic organic chemicals. The variations between the BOD value of wastewater effluents and the BOD values in streams is also discussed.

F-74 "Cyanide Destruction on Trickling Filters," Gurnham C. F., Proceedings of the 10th Industrial Waste Conference (1955) Purdue University, p. 186.

Laboratory scale trickling filter experiments were conducted to determine the treatability of cyanide-bearing sewage. The results of these experiments are discussed in this article. A general discussion on simple and complex cyanide forms is also presented.

F-75 "A Biodegradability Test for Organic Compounds," Bunch R. L. and C. W. Chambers, Journal of the Water Pollution Control Federation, Vol. 39, No. 2, p. 181 (February, 1967).

A specific laboratory procedure to determine biodegradability is described in this article. The application of the test and the time required for its adaptation is also indicated.

F-76 "A Procedure and Standards for the Determination of the Biodegradability of Alkyl Benzene Sulfonate and Linear Alkylate Sulfonate," The Subcommittee on Biodegradation Test Methods of the Soap and Detergent Association, Journal of the American Oil Chemists Society, Vol. 42, No. 11, p. 986 (November, 1965).

This article presents a procedure to measure the biodegradability of the compounds mentioned in the title. A semi-continuous activated sludge process to simulate sewage treatment and act as a confirming test is also described.

F-77 Treatment of Mixed Domestic Sewage and Industrial Waste in Germany, Organization for Economic Co-operation and Development, December, 1966.

This extensive document covers all aspects of sewage treatment in Germany, including the pollution effects of sewage, pretreatment, design criteria and the industry charge systems in use.

F-78 "Solids Retention in Anaerobic Waste Treatment Systems," Daque R. et. al., Journal of the Water Pollution Control Federation, Vol. 42, No. 2, Part 2, p. R29 (February, 1970).

This article presents the results of a laboratory study to determine biological solids retention times in anaerobic waste treatment systems. Factors which affect retention times and methods for their control are also discussed.

F-79 "Techniques for Removing Metals from Process Wastewaters," Cadman, T. W. and R. W. Dillinger, Chemical Engineering, April 15, 1974, p. 79.

This general article presents the state-of-the-art of most major methods of metals removal. Strontium and manganese are discussed individually, and a summary of the effects of many ion exchange resins on metals is also presented.

F-80 "Compact Activated Sludge Treatment of Combined Pretrochemical-Municipal Waste," Kumke G. W. et. al. Water and Wastes Engineering, Vol. 6, No. 5, p. Cl, (May, 1969).

A four year evaluation of the activated sludge process performance of the South Charleston, West Virginia Waste Treatment Works was conducted. Performance data on BOD, COD and suspended solids is presented in this article.

F-81 "Nitrogen Removal by Modified Activated Sludge Process," Balakrishnan B. and W.Eckenfelder, Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 96, No. SA2 p. 7236 (April, 1970).

Nitrification research studies with respect to the activated sludge and trickling filtration processes are reported in this article. The effects of organic loading and hydraulic loading on nitrogen removal are also discussed.

F-82 "Removal of Sugars by Activated Sludge," Painter, H. A. et. al., Water Research, Vol. 2, No. 6, p. 427, (1968).

This article presents the results of laboratory experiments on the removal of sugars by activated sludge. The efficiency of sugar removal, the relationship between gluecose loading and sludge activity and the relationship between BOD loading and sugar removal are all discussed.

F-83 "Grease Management in Wastewater Treatment," Cibulka J. J. et. al., Proceedings of the 3rd Mid-Atlantic Waste Conference (1969).

The grease removal efficiencies at a treatment plant with a grease removal chamber in Blacksburg, Virginia are reported in this article. The results of a laboratory study are also presented. Factors which affect grease removal are indicated and include prechlorination, primary sedimentation, pH, and retention time.

F-84 "Treatability Studies of Industrial Wastes Effected through Process Simulation," Baker R. W. and F. Guillaume, Water and Sewage Works, Vol. 116, No. 9 p. IW32 (September, 1969)

This article indicates how laboratory treatability studies can simulate treatment plant operations. The laboratory studies can identify problems in advance of design and aid in their correction.

F-85 "Starch Removal with Non-Acclimated Activated Sludges," Banerji S. K. et. al., Water and Sewage Works, Vol. 114, No. 4, p. 134 (April, 1967).

A laboratory study was conducted to determine the mechanism and efficiency of starch removal by activated sludge. The factors which affect starch removal and the effect of shock loadings were also considered. The study results are presented in this article.

F-86 "Variability of Waste Treatment Plant Performance," Thomann R. V., "Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 96, No. SA3, p. 816 (June, 1970).

Statistical techniques were applied to the time variations of waste treatment processes of municipal plants. Data were obtained from eight plants, and BOD was the major parameter considered.

F-87 "Removal of Metals by Chemical Treatment of Municipal Waste Water," Nilsson, Rolf, Water Research, Vol. 5, No. 2, p. 51 (1971).

The reduction of the metal content of wastewaters by chemical precipitation with aluminum sulfate and calcium sulfate is reported in this article. The reductions of chromium, lead, copper, mercury, cadmium, arsenic, nickel and copper are related to pH and precipitant levels.

F-88 "Heavy Metals in Wastewater Treatment Plant Effluents," Mytelka A. I., Journal of the Water Pollution Control Federation, Vol. 45, No. 9, p. 1859, (September, 1973).

The Interstate Sanitation Commission routinely analyzes the metals removal capability of municipal wastewater treatment plants within its jurisdiction. This article presents the results from some of these analyses.

F-89 "Treatment of Mixed Sewage and Textile Finishing Wastes on Trickling Filters and Activated Sludge," Gibson F. M. and J. H. Wiedman, Proceedings of the 17th Industrial Waste Conference (1962), Purdue University.

Pilot studies were conducted at the Greater Greenville Sewer District, South Carolina, to determine the treatability of combined textile wastes and domestic sewage. The economy of treatment and the relationships between removals and pH and alkalinity were also studied.

F-90 "Treatability of Oily Wastewater from Food Processing and Soap Manufacture," McCarty P. L. et. al., Proceedings of the 27th Industrial Waste Conference (1972), Purdue University, p. 867.

Laboratory investigations were conducted to determine the treatability of pure fatty substances and selected industrial wastes from a Proctor and Gamble complex in Cincinnati, Ohio. The removal efficiency of the treatment plant and the effect of the wastes on the activated sludge and anaerobic digestion processes are reported in this article.

F-91 "Amenability of a Mixture of Sewage, Cereal and Board Mill Wastes to Biological Treatment," Quirk, Thomas P., Proceedings of the 13th Industrial Waste Conference (1958), Purdue University, p. 523.

This article presents the results of a laboratory scale study to investigate the feasibility of treating a mixture of industrial wastes and domestic sewage by activated sludge. The oxygen transfer rates observed, the process loading removal characteristics, the oxygen demand rates, the required detention times and the sludge handling characteristics are also discussed.

F-92 "Combined Treatment of Tannery and Municipal Wastes," Nemerow N. L. and R. Armstrong, Water and Wastes Engineering, Vol. 6, No. 7, p. D-6 (July, 1969).

The results of laboratory experiments are presented, which indicate that activated sludge, or a modification of the process, can be utilized to treat combined tannery and domestic wastes.

F-93 Removal of Heavy Metals by Conventional Treatment, Logsdon G. S. and J. M. Symons, reprinted from U. S. EPA Region II Report #902/9-74-001 (Traces of Heavy Metals in Water, Removal and Monitoring).

This paper summarizes the research that has been conducted at the NERC laboratory in Cincinnati on removal of trace inorganic substances by water treatment processes. Among the chemicals discussed are methyl mercury, inorganic mercury, barium, selenates, selenites, arsenites and arsenates.

F-94 Performance of Northern California and Pacific Northwest Municipal Treatment Plants in Oil and Grease Removal; CH2M Hill Consulting Engineers, Sacramento, California.

Removal and sampling data is presented on oil and grease and BOD for 11 municipal plants. Oil and grease removals range from 47.9 to 96.4% with an average removal for all 11 plants of 86.9%.

F-95 Performance of New York and Connecticut Municipal Treatment Plants in Oil and Grease Removal; Hydroscience, Inc.; Westwood, New Jersey.

Influent and effluent sampling data on oil and grease and BOD is presented for 38 municipal plants. Oil and grease removal varied from a low of 19.2% to a high of 99.7% with an average removal of 78.6%.

F-96 Performance of Two Municipal Treatment Plants In Texas in Oil and Grease Removal; Hydroscience, Inc.; Westwood, New Jersey.

Data for June 1973 (Austin plant) show an average oil and grease removal of 72.5% and a range of 32 to 95% removal; for July 1973 (Austin plant) the data shows an average oil and grease removal of 96.8% with a range of 88 to 100% removal. Influent and effluent sampling data of BOD and ether solubles is provided for the Fort Worth plant from 1973 to 1975. The average oil and grease removal was 46.6%.

F-97 Performance of Two Midwest Municipal Wastewater Treatment Plants in Oil and Grease Removal; Dr. L. W. Polkowski; Madison, Wisconsin.

Influent and effluent sampling data of BOD, SS, and hexane extractables is provided for the Jones Island Plant in Milwaukee, Wisconsin, and another unnamed plant. Oil and grease removal at Jones Island ranged from 76.1 to 99.5% with an average removal of 85.9%. Oil and grease removal for the unnamed plant varied from 86 to 92% with an average removal of 89%. A comparison of measurements by the alumina column and thin layer chromotography methods is also provided.

F-98 Comments on Hexane Extractable Materials and Problems at Municipal Treatment Plants; W. Wesley Eckenfelder, Jr.; Vanderbilt University; Nashville, Tennessee.

The report discusses the biodegradability of organic compounds and in particular, hexane extractable materials in wastewaters containing vegetable and animal fats and oils.

F-99 Oxidation of Biodegradable Oil and Grease as Measured in BOD tests; James C. Young; Iowa State University; Ames, Iowa.

A study to investigate the effect of oil and grease on BOD test measurements and the impact of such measurements on setting standards for oil and grease discharged by industry to municipal sewerage systems and by treatment plants to streams is presented.

F-100 (See E-130)

Hexane extractable removal information for six plants of the Metropolitan Sanitary District of Greater Chicago are presented. The removal data varies from 26 to 64% with an average oil and grease removal of 48.8%. Also included is a series of pilot studies on various industrial wastes to determine oil and grease removals.

For additional information pertaining to this section, please refer to the following articles:

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